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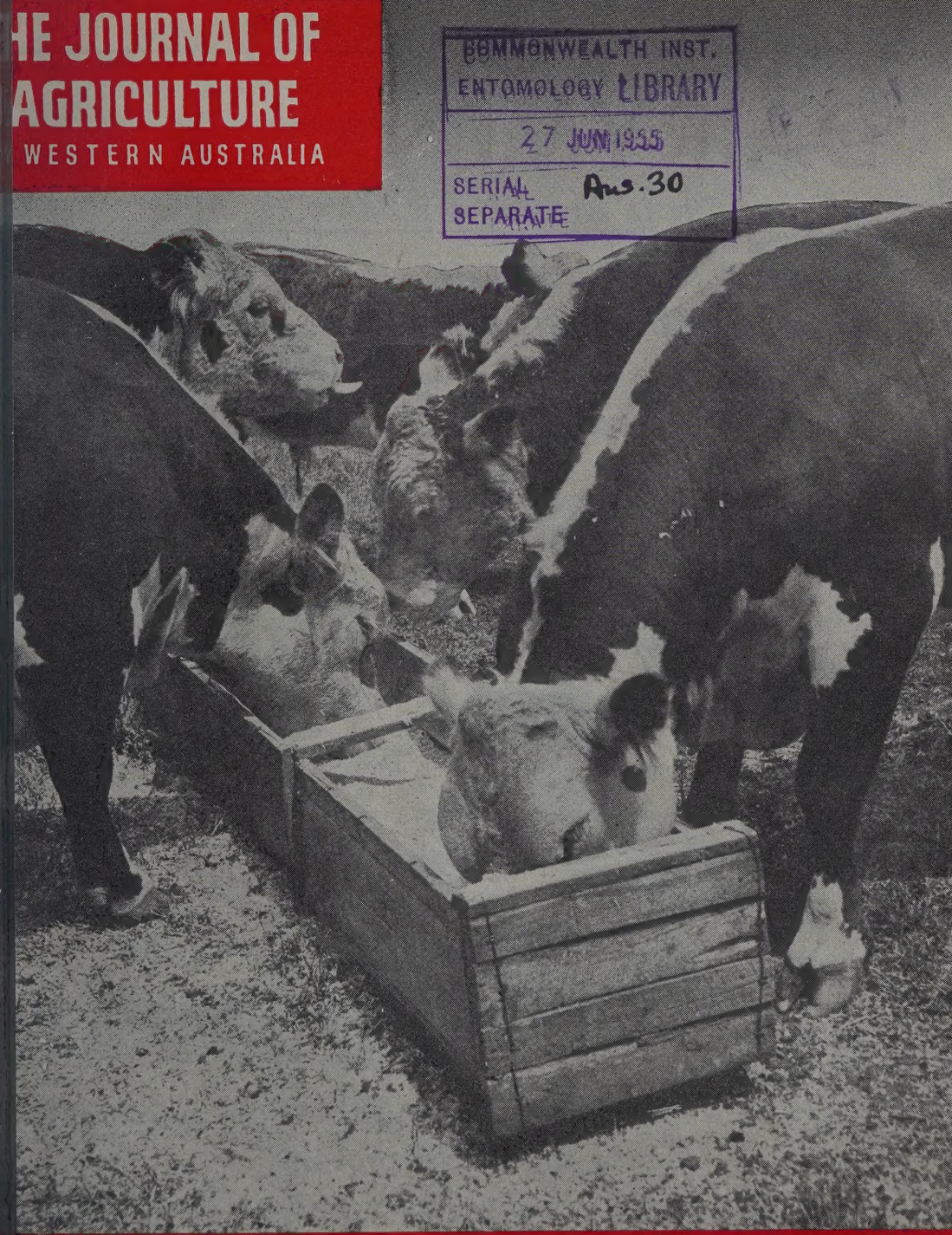

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COVER PICTURE

A group of young Poll Hereford bulls enjoy a supplementary ration at the Pardelup Prison Farm. The farm maintains a Poll Hereford stud in addition to pig studs and a large dairy herd

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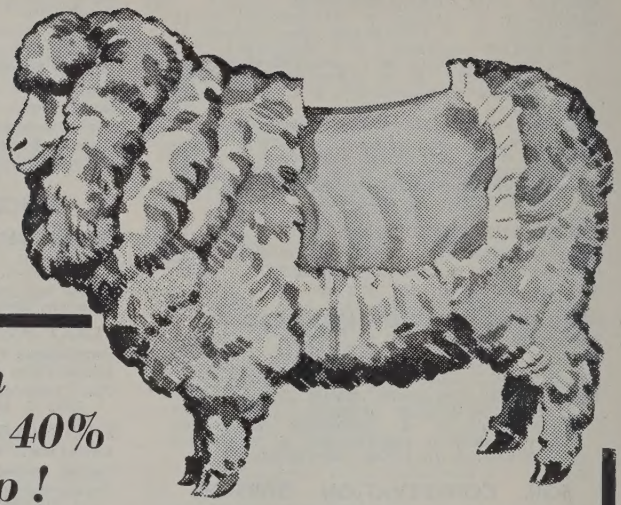

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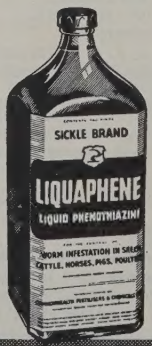

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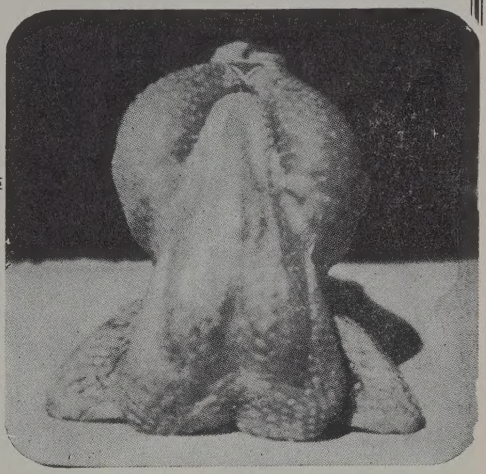


1.—Some General Principles

By

D. K. GILES, B.Sc., Agric. (Hons.),
Poultry Adviser

TO show a good profit from the sales of poultry meat it is obvious that the prices received for the finished birds must be well above the cost of bringing them to marketable weights. Feeding and management costs are under the control of the producer—he can keep them at a reasonably low level by good farming practices—but market prices are beyond his influence.

Several factors play an important role in successful poultry meat production. Some of the most important are listed below:—

Rapidly Growing Birds.

The producer's aim should be to market the maximum weight of good quality carcasses for the lowest possible outlay, and birds which will grow quickly are the first essential if outlay is to be kept small. Choose birds of suitable healthy quick-growing strains and feed them the cheapest ration that will ensure good carcass weights in the shortest possible time.

Mortality.

There is no profit in dead chicks, so the successful producer must cut down mortality rates by attention to sound breeding, good feeding and management and by making every endeavour to keep them free from disease.

Labour.

The return per bird is small so that the greater the number of birds handled efficiently by each man, the greater will be the profit.

Capital.

Lack, or misuse of capital causes many of today's failures. The farm must be large enough and sufficiently well-equipped to provide an adequate living. Many farmers do not possess sufficient ready cash to purchase equipment and operate a property and consequently must depend upon borrowed money.

Banks and other financial institutions are naturally only interested in lending money where they can see that it is a safe investment. They require the property to be equipped with sound buildings and adequate equipment which will last at least long enough to give them a satisfactory asset during the term of the loan.

Fig. 1.—Poultry meat production is big business in the U.S.A. This shed is part of a plant producing table birds for the home and export market and gives some idea of the scale on which operations are conducted in that country

Very few farmers can afford to pay cash for large quantities of feeding stuffs and replacement stock so that short-term loans are also essential.

In such cases the security of the financing institutions lies in the efficiency of the farmer. If he is a good manager and makes consistent profits he is a sounder investment, from the banker's or feed merchant's point of view, than the happy-go-lucky farmer who occasionally lets his brooders go out.

Whether the producer is raising poultry meat as a side-line or as his sole means of livelihood, the same principles apply. He needs capital in each case, and efficiency makes the capital easier to obtain.

Marketing.

The poultry meat producer has his own special marketing problems as the profit per bird is usually small, and the age at which he sells his birds to obtain the maximum profit can be limited to a few days. This means that a small drop in prices can turn potential profits into losses. On the other hand an unexpected rise in prices could lift the profits well above the original estimates. Few producers can afford to gamble on market fluctations however, so a wise man will seek some form of insurance against losses from this cause. Possibly the soundest insurance is to contract for the sale of his birds before they are housed. He then knows the gross price he will receive and the particular body-weights required so that it is not difficult for him to make a fairly sound assessment of his chances of profit.

A second safeguard is to prepare for times when prices may be low by starting a reserve fund when prices are high. Any extra profits, over and above the normal margin, should be put aside and held in reserve to off-set possible future losses.

The farmer who rears carcass poultry as a side-line to other activities, has an alternative means of safeguarding his investment. During periods of depressed prices it is not difficult for him to divert his feeding stuffs into other forms of production —or alternatively he can sell his stocks and still live on the income from his other farming activities until conditions improve.

No. 2—A Recommended Ration

CORRECT feeding is essential if we wish to make a profit from the production of poultry meat. It is obvious that the most efficient ration is the one that will give the most rapid weight gains for the least expenditure on feeding stuffs—in other words one that gives the producer the maximum income for the minimum outlay.

In order to obtain information concerning the most suitable ration, the Department of Agriculture's Poultry Research Station instituted feeding experiments in July 1954. In these experiments 60 different rations were fed to first-cross cockerels.

To indicate the scope of these experiments it is worth mentioning that the best ration produced an average live-weight of 3 lb. at 12 weeks of age, and the worst only 1½ lb. live-weight at the same age. Again, at 12 weeks the best ration required 3¼ lb. of food for each 1 lb. gain in live-weight while the worst required 6 lb. of food to produce the same gain.

The ration recommended here is the one which gave the best all-round results in the experiments. The experiments are still being continued in the hope of finding still more efficient methods of feeding and as new information comes to hand, so our recommendations will be modified accordingly.

The recommended ration is in two parts —1A for birds up to six weeks of age, followed by 1B which is suited to birds from seven to 16 weeks of age. The compositions of the recommended rations are shown in Table "A."

Fig. 2.—This photograph of an American "broiler" cockerel, gives some idea of the type of bird which can be produced by careful attention to breeding and feeding. The ideal "broiler" weighs 3½ to 4 lb. at 12 weeks or less and gives an attractive and fully-fleshed carcass

TABLE "A"—A RECOMMENDED RATION FOR POULTRY MEAT PRODUCTION.

	Ration 1 A Chicks to 6 weeks.	Ration 1 B 7 to 16 weeks
Wheatmeal	60 lb.	60 lb.
Bran	20 lb.	20 lb.
Dried Butter Milk Powder	4 lb.	....
55% Animal Protein (Meatmeal and Whalemeal)	14 lb.	16 lb.
Tricalos	1 lb.	1 lb.
Manganese Sulphate *	1¼ grammes	1¼ grammes
Vitamin A and Vitamin D 3. (as Vetemul, Apac, or similar preparations) plus commercial Riboflavine	4 tablespoonfuls	4 tablespoonfuls

* 1¼ oz. per ton.

The feeding of both green feed and insoluble grit in addition to the above ration could be commercially profitable.

Both rations have a crude protein content of 18 per cent. and a ratio of 60 parts by weight of wheatmeal to 20 parts of bran.

At all ages this ration was more efficient than any other ration used. Growers will find that the body-weights will vary with different strains but the ratios will be similar, and the weight of food required to produce 1 lb. live-weight will vary very little.

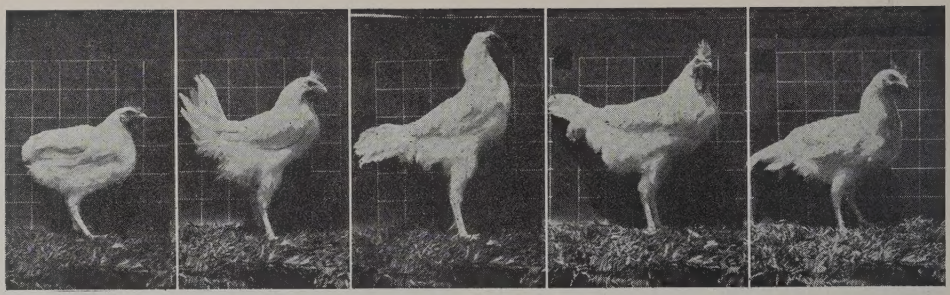


Fig. 3.—All these birds are the same age (16 weeks); they were fed on rations containing the same proportions of wheatmeal and bran, but different levels of protein. From right to left, the protein levels and liveweights were as follows: 14%, 2 lb. 10 oz.; 16%, 3 lb. 0 oz.; 17%, 3 lb. 5 oz.; 18%, 4 lb. 2 oz.; 24%, 3 lb. 10 oz.

This illustrates the advantage to be gained by feeding the recommended ration containing 18% crude protein. At higher levels there was no increase in bodyweight, in fact when the level was increased to 24% there was a decrease of ½ lb.

These birds are the average types taken from groups of nine used in the feeding trials. The differences in growth were obvious from four weeks onward.

No 3—Time of Marketing

AS was stated earlier, the margin of profit on each individual bird is small, so that the age at which the birds are marketed becomes a very important factor in poultry meat production. The time at which sales may be made to the best advantage is naturally influenced by many factors. Price fluctuations due to market demands, the live-weight requirements of the processors, weather conditions, the availability of labour at any given period and the current costs of feeding-stuffs, all play their parts.

As a broad general rule however we recommend that birds should be marketed between the 11th and 14th weeks as it is during this period that the greatest profit per bird is most consistently available.

For example if we take 2s. 6d. per lb. as the live-weight return, an 8-weeks old bird of 1½ lb. live-weight would bring 3s 9d. Food costs at this age, in the case of the experimental birds, averaged 1s. 2½d., leaving a profit over food costs of 2s. 6½d. or an average weekly profit of 3.8d. per bird.

A 12-weeks-old bird of 3 lb. live-weight would bring 7s. 6d., at a food cost of 2s. 10d. This would leave a net profit of 4s. 8d., or an average weekly profit for the period, of 4.7d.

Comparative figures for various ages and weights are given in Table. "B."

These figures are based on a live-weight return of 2s. 6d. per lb. and feed costs at £30 per ton.

It will be seen from these figures that the 11 to 14 week period gives the highest average weekly profit per bird. At these ages we have a popular range of live-weights for the processor to choose from.

TABLE "B"—AVERAGE FOOD CONSUMPTION AND PROFITS AT DIFFERENT AGES.

Age in Weeks.	Live-Weight.	Food Consumption	Gross Return per Bird	Food Costs.	Net Profit	Average Weekly Profit
	lb.	lb.	s. d.	s. d.	s. d.	
8	1·5	4·2	3 9	1 2½	2 6½	3·8d.
9	1·8	5·4	4 8	1 7	3 1	4·1d.
10	2·2	6·7	5 7½	1 11½	3 8	4·4d.
11	2·6	8·1	6 7	2 4½	4 2½	4·6d.
12	3·0	9·6	7 6	2 10	4 8	4·7d.
13	3·3	11·2	8 3	3 3	5 0	4·6d.
14	3·6	12·9	9 1	3 9½	5 3½	4·6d.
15	3·8	14·6	9 8	4 3	5 5	4·3d.
16	4·0	16·3	10 0	4 8	5 4	4·0d.
20	4·7	23·5	11 10½	6 10	5 0½	3·0d.

Net profits are higher in the case of older and heavier birds but these returns are offset by added labour costs **which have not been included in these calculations.**

Furthermore by quitting the birds at 11 to 14 weeks of age the brooder-houses and installations can be used to turn out three batches of birds each year, allowing

Fig. 4.—A view of the cages housing birds during the feeding trials conducted at the Department of Agriculture Poultry Research Station, Herdsman Lake. The birds were hot-water brooded in these cages on deep litter and housed in them throughout the experiment

adequate time for disinfection and maintenance of buildings, and also for a suspension of activities during the unfavourable summer period.

It should be the aim of a producer to utilise his buildings and equipment to the fullest possible extent in order to obtain the greatest returns from his capital investment, so that, if they are being used for meat production only we strongly advocate rearing three batches annually. If birds are kept longer than the 14 weeks maximum it will be difficult to rear three batches under ideal conditions.

It will be obvious too, that the longer the birds remain in the producer's possession, the greater will be the risk of losses from disease and injuries.

These hazards tend to increase rapidly after about the 12th week because the increasing size of the birds tends to cause overcrowding.

Another point which affects the quitting period is that if the price per lb. liveweight falls below 2s., the age range at which the birds can be disposed of profitably is narrowed considerably. Under such circumstances we recommend that the birds should be marketed at approximately 12 weeks of age.

For instance it will be noted from the Table "B" that at 2s. 6d. per lb. the actual decline in net returns does not occur until the 16th week. A little calculation will show that if the live weight price dropped to 1s. 6d. per lb. the net return reaches its peak at 13 weeks and declines immediately, if the birds are kept longer.

Premium Payments.

So far we have discussed returns on a basis of flat rate payments per lb. liveweight.

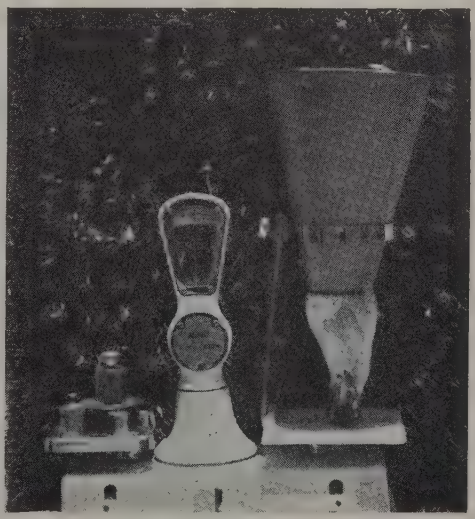


Fig. 5.—The equipment used for weighing birds from eight weeks onward during the experiment. The bird is placed head downward in the cone which holds it firmly during the weighing operation

Under certain circumstances it is possible that a demand could arise for lighter or heavier birds to meet special processing requirements. In such a case, a premium payment would be needed to give satisfactory returns.

For example if the normal return for a 12-weeks-old bird was 2s. 6d. per lb. liveweight, the price for an 8-weeks-old bird would need to be 3s. per lb., and the price for a 16-weeks-old bird 2s. 9d. per lb. to give an equivalent average weekly profit.

In these calculations we have again ignored the time factor with its attendant risks and added labour costs. If these are to be taken into consideration some slight reduction in premium might be permitted on the light weight birds and conversely an extra premium would be needed for the heavy weights.

ACKNOWLEDGMENT

Grateful acknowledgment is made to a number of people who assisted in the conduct of these experiments. In particular the author wishes to thank Mr. R. Hickson of Swan View who donated the day-old cockerels used in the trials; Mr. N. S. Stenhouse of the C.S.I.R.O. section of Mathematical Statistics for the statistical analyses; also Messrs. R. J. Moir and H. P. Schapper of the Institute of Agriculture, University of Western Australia for helpful suggestions and criticisms.

(To be continued.)

RELY ON

'RULENE'

D.D.T. INSECTICIDE

RUL. 3X. 4346

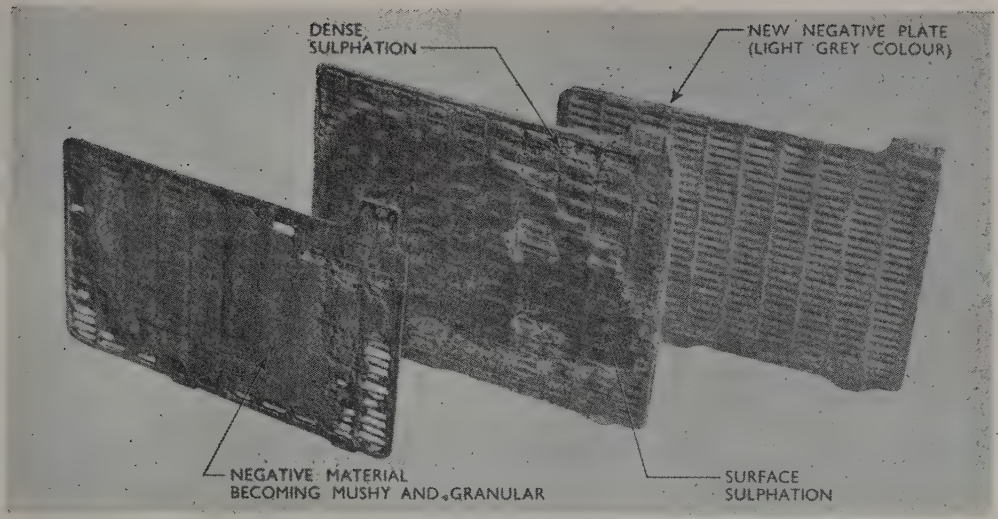

DENSE SULPHATION
NEW NEGATIVE PLATE (LIGHT GREY COLOUR)
NEGATIVE MATERIAL BECOMING MUSHY AND GRANULAR
SURFACE SULPHATION

Fig. 1.—Negative plates affected by low electrolyte levels

TRACTOR SERVICE HINTS

SOME POINTS ON BATTERY MAINTENANCE

(Supplied by courtesy of the Technical Group, Service Division, Ford—Australia.)

MANY tractor batteries are inadequately maintained in service, and even when the effects of misuse or unsatisfactory operation are obvious, little, if any, corrective action is taken. Failure to maintain the electrolyte levels, overcharging and undercharging are all factors which are consistently overlooked by tractor owners and those responsible for battery maintenance.

When it is found necessary to add distilled water frequently in order to maintain the electrolyte levels, and yet there are no visible signs of leakage or spillage from the casing, this is a definite sign of overcharging, and the condition should be investigated immediately by your local service agency.

EFFECTS OF LOW ELECTROLYTE LEVELS

Allowing the electrolyte to fall below the upper edges of the plates will, with continued charging, rapidly accelerate the rate of falling levels, resulting in still further areas of the separators and also the plates becoming exposed. Those areas of the negative plates exposed will commence to sulphate (see centre plate, Fig. 1), and have an immediate effect upon battery capacity.

As low levels develop the electrolyte becomes stronger, and will soon reach a dangerously high concentration, which will char and disintegrate the separators. In addition, the negative plates may be permanently damaged, due to the paste in the plates being changed to a "mushy" condition. The material will then loosen and fall from the lead grids.

The effects of overcharging on the positive plates are equally serious. Overheating, due to the rapid chemical action, will bring about buckling and distortion similar to that illustrated in Fig. 4.

Fig. 2.—A positive plate which has "grown" due to overcharging

The plates will tend to increase their size or "grow" (Fig. 2), and the lead grids will begin to shed their active material.

An advanced form of these effects is illustrated (left-hand plate, Fig. 4.) In this case, the grid has corroded to such an extent that it has become completely broken up.

The electrolyte level must be maintained at a $\frac{1}{4}$in. to $\frac{3}{8}$in. above the separators, and the fully charged working gravity is 1.270 to 1.285 when corrected to 70 F.

C.V.C. CHARGING

It must be understood that a C.V.C. system only tends to eliminate overcharging under normal conditions.

Under the following conditions overcharging can still occur even when a C.V.C. charging system is in use—

(1) Very low electrolyte levels.
(2) A battery which is reduced in capacity as a result of sulphation.
(3) Incorrect regulator adjustment.

EFFECTS OF OVER-DISCHARGE AND/OR INSUFFICIENT CHARGE

It is well known that a battery should never stand in a "run-down" condition. Similarly, a battery operated with insufficient charge over a long period of time may develop a type of sulphate in the plates which is dense, hard and crystalline and which cannot be converted back to normal active material again.

The condition will cause a considerable drop in battery capacity, also internal stresses in the positive plates, which will give rise to distortion or bowing of the type illustrated in Fig. 3.

The tendency for "bowing" will be increased if the battery when in this condition, is subjected to sudden prolonged overcharging as might be experienced on a long journey or by a C.V.C. regulator, which is not functioning correctly.

A severely buckled plate will pinch the separator on one side, at the plate corners and also chafe the centre of the separator, on the opposite side.

Separators subjected to this pressure are likely to become perforated, when short circuits between the plates in each cell will develop and result in complete failure.

THE EFFECTS OF INCORRECT CLAMPING

(a) Loose Clamping.

If the battery is allowed to move in its carrier under operating conditions, then it is probable that the grids on which the plate groups stand in the casing will be

Fig. 3.—The effect of insufficient charge on a positive plate

notched and cause severe disarrangement of the plate and separator groups.

Vibration of the battery in its carrier may also crack or wear the casing, causing the sealing compound to open up and allow acid to leak. This will cause corrosion and damage to wiring installation and metal surfaces, apart from early failure of the battery.

(b) Too Tight Clamping.

If the battery mounting bolts are tightened excessively, it is probable that the battery casing will either crack, distort and/or loosen the sealing compound around each cell group, again allowing loss of electrolyte. It is probable that under these conditions the end cells will be those most affected.

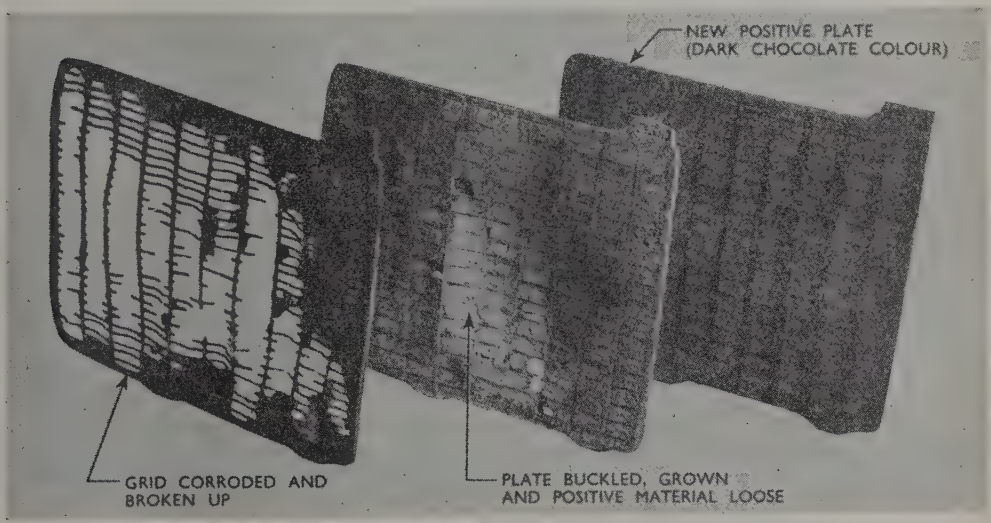


Fig. 4.—Positive plates affected by constant overcharging

PIG FORECAST

The 1955 pig crop forecasts are waiting on a full return of pig raisers' question cards to the Commonwealth Bureau of Agricultural Economics.

All interested in the future of the pig industry realise the importance of an early accurate forecast, which is the main purpose of this new service introduced by the bureau. Farmers still holding cards are asked to complete them without delay.

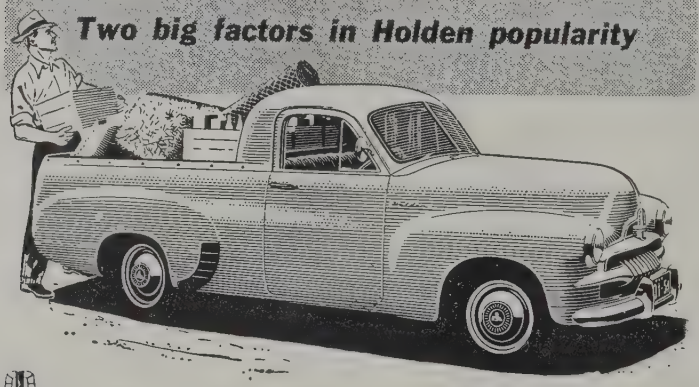
Mr. G. K. Baron Hay advises that more contributing farmers are wanted to increase the sample, and farmers raising pigs are invited to send their name and address to the Bureau of Agricultural Economics, Canberra, A.C.T., or the Department of Agriculture, Perth, so that a card can be sent to them at the next pig crop report.

The eight questions on the report card are not complicated and the answers are completely confidential and only recorded under code number. In addition to the forecast the answers provide valuable statistics of pig production, including average litter sizes farrowed and weaned, and losses after weaning.

The pig crop report is published twice a year and is immediately forwarded to contributing farmers and to other farmers requesting copies.

DURABILITY ECONOMY

Two big factors in Holden popularity



Durability and consistent economy of operation are two big factors in the popularity of Holden Utility. Writing from Stanmore via Woodford, Queensland, Mr. A. A. Miller, a timber contractor says: "*My Holden Utility . . . has given me over 30,000 miles of trouble-free motoring. I cover some very rough country, but at no time has my Holden let me down*".

Mr. H. G. Millard, Paint Supplies Co., Grote Street, Adelaide, says his utility "*. . . has now covered 26,000 miles entailing a great deal of stops. Petrol consumption has consistently been over 30 m.p.g. . . .*" Only Holden Utility combines this economy with six cylinder power, 21 h.p. performance, a low list price, high resale value, and nation-wide availability of low-cost factory guaranteed parts and service. *In view of the very heavy demand for Holden Utility we would suggest you place your order as soon as possible.*

HOLDEN SALES LEADERSHIP

Official sales figures for 1954 show that 14,511 Holden Utilities were registered during the year, compared with 4,355 registrations of the next most popular model. To speed up delivery and meet the ever increasing demand for Holden, GMH is now proceeding with a further £7¼ million expansion programme.

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INSECT Pests AND THEIR CONTROL

By C. F. H. JENKINS, M.A., Government Entomologist

THE RED SPIDER

*Tetranychus telarius (L.)**

THE red spider is a very common pest of vegetables, garden plants and some types of fruit trees during the summer. It should not be confused, however, with the red-legged earth mite (Halotydaeus destructor), which is such a serious pest of seedlings, but during the winter season only.

The red spider was first described from Europe as long ago as 1761, and since then it has been recorded from most countries of the world.

Like the red-legged earth mite, the red red spider is really a mite, not a true insect, but for all practical purposes, it may be included in the insect pest category.

GENERAL DESCRIPTION

The adult female is barely visible to the naked eye, being only about 1/50th of an inch in length. The colour varies considerably, being often greenish brown or yellowish, but more generally rust or brick red. Darkish spots can usually be seen on the back with the aid of a strong magnifying lens. The male is smaller than the female and usually reddish in colour.

Being true mites, both sexes have eight legs, and not the customary six characteristic of insects.

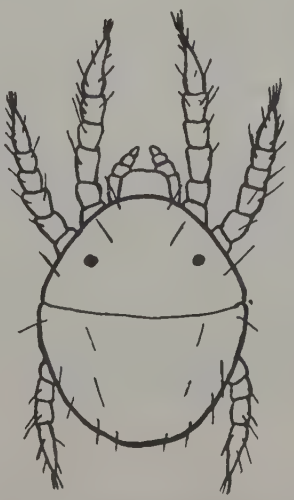

Fig. 1.—Young Red Spider (X200). (Univ. Flor. Exp. Stn).

LIFE HISTORY AND HABITS

The round, somewhat transparent eggs, which cannot be seen without the use of a hand lens, are laid on the under sides of the leaves of selected host plants. Each female may lay from 70 to 100 eggs during her average life of two or three weeks, and usually lays from three to six daily. The

* Sometimes referred to as *T. urticae.*

eggs are laid irregularly on the leaf surfaces and under favourable conditions hatch in four or five days.

The young mites are almost transparent on first hatching, and have only six legs. They soon commence feeding and acquire a greenish tinge. Later they moult their first skin and become eight-legged like the adults. In warm weather the mites may reach maturity in a little over a week, so that from egg-laying to adult may occupy less than a fortnight. This rapid development explains how such swarms of red spiders can appear apparently from nowhere to plague our gardens during hot summer weather.

Although the normal life of the adult red spider, as already indicated, is only about a fortnight or three weeks, under cold conditions this period may be greatly lengthened. The females become inactive, shelter in secluded situations, and in this manner spend the winter. With the arrival of spring they again become active, and lay eggs which give rise to the first spring generation of the pest.

The mouth parts of the red spider are adapted for lacerating the plant tissue and sucking up the oozing sap. The feeding injury causes pale spots to appear on the infested foliage, and soon leaves acquire a mottled and unhealthy appearance. A heavy infestation of the pest may cause the foliage to bleach altogether and finally to shrivel.

The web-spinning habit so characteristic of the red spider increases the disfigurement of the infested leaves. The threads of the webbing are too fine to see with the naked eye, but the under side of a badly attacked leaf often has the appearance of having been dusted with fine powder. This impression is conveyed by the numerous cast skins and excreta of the feeding "spiders" sticking to the leaf.

Being quite devoid of wings or any other means of rapid progression, it may seem surprising that the red spider is so widespread. It has, of course, been carried from one country to another with introduced plants. Local dispersion would occur in the same way, but in addition it is known that the creature may be borne by the wind for considerable distance, and that it can also be swept from higher to lower ground by flood waters.

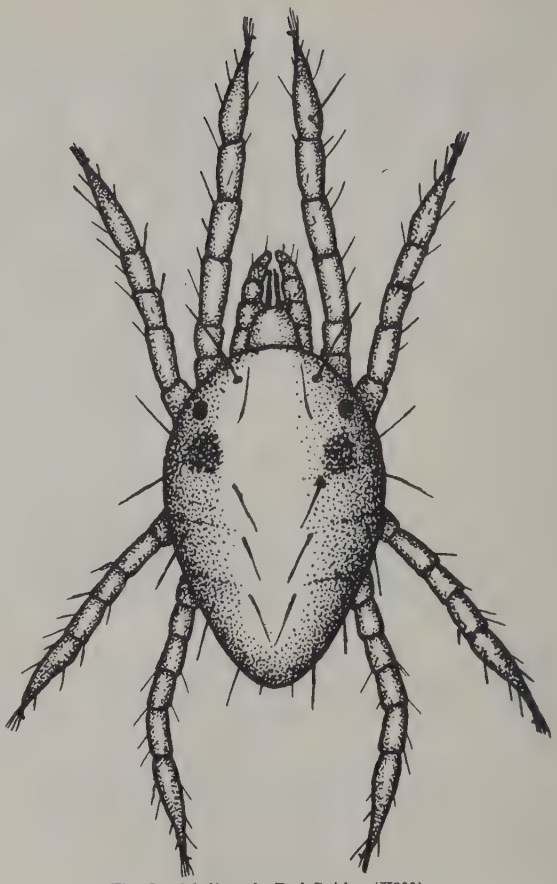

Fig. 2.—Adult male Red Spider (X200). (Univ. Flor. Exp. Stn).

HOST PLANTS

A complete list of host plants would be too long to include, but some examples are peas, beans, cucumbers, marrows, cotton, tomatoes, tobacco, violets, carnations, geraniums, and strawberries, as well as many shrubs and deciduous fruit trees.

CONTROL

The effective control of the red spider entails prompt action and thorough treatments especially to the under-surface of the leaves as soon as the pest is detected.

Chemical Control.

Sulphur dusts and sprays have been extensively used for the control of the red spider but some of the newer miticides are now supplanting the old treatments. Where sulphur is used care should be taken not to use it during a heat wave as scalding to foliage may occur. When sulphur dust is applied it should be diluted with equal parts of some carrier such as slaked lime.

Lime sulphur spray should generally not be used at a greater strength than 1 part to 60 parts of water, and on delicate plants the dilution should be 1 to 100.

Colloidal sulphur and other forms of sulphur sprays should be used in accordance with the manufacturer's instructions.

Parathion and HETP ("Hexone") are two new materials (known as organic phosphates) which are particularly effective against most types of mites and are widely used for red spider control. They should be diluted in accordance with the manufacturer's recommendations and used with considerable care. Gloves should be worn when handling the concentrate and should any material splash on the bare skin it must be washed off immediately. Care should be taken not to inhale the spray mist during application to the plants.

"Hexone" has little lasting effect and so must be thoroughly applied. Parathion, on the other hand, has some residual action and should not be applied to fruits or vegetables later than a month before picking.

Special Miticides. P.C.P.B.S.[1] and "Ovotran"[2] types of miticides are quite recent developments. These materials are very selective in their action and, although harmless to most insects, they are very toxic to the eggs and immature stages of certain mites. They should be applied after the winter eggs of the red spider have hatched but before the summer population has had time to reach plague proportions. The general use of these new materials cannot yet be recommended under local conditions as some foliage injury may occur to susceptible plants under certain weather conditions. Some growers, however, may be interested to carry out their own tests.

Systemic Insecticides. Certain chemicals have recently been developed with systemic properties which means that when applied either to the roots or foliage of a plant the insecticide is absorbed into the sap stream and renders certain areas of the plant toxic to sucking pests.

Fig. 3.—Tomato shoot showing discolouration due to Red Spider injury.

Most of the systemic materials are toxic to the higher animals and can only be used under certain circumstances. "Systox" is available on the local market and has given good results against aphis and red spider. "Systox" should not be applied to plants required for human consumption and the manufacturer's instructions should be carefully followed.

1. Parachlorophenyl benzene sulphonate = "Vallomite," "Elimite," etc.
2. Parachlorophenyl para chloro benzene sulphonate = "Ovomite," "Ovobone," "Mitran," etc.

Biological Control.

The value of natural enemies in combating the red spider is well demonstrated by the fact that the "spiders" increase rapidly following the use of DDT. Natural enemies, especially small ladybirds, are easily killed by the DDT but the red spider and various other mites can withstand strong DDT applications. Where there is danger of red spider attack, therefore, DDT should be used as sparingly as possible.

Cultural Methods.

It has been frequently shown that the red spider thrives best under hot, dry conditions. Where plants can be kept well watered, especially with overhead sprinklers, the result is a definite drop in the "spider" population, and this means of control is adopted by many gardeners.

As the red spider attacks a variety of weeds as well as cultivated plants, the necessity for clean cultivation will be self evident.

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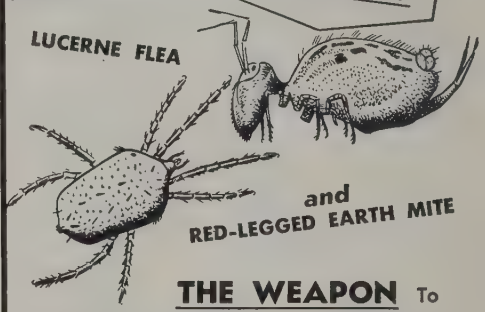
REDCLIFFE PARK - - - - ML 543

'Phosfone' Insecticide
'Pespruf' DDT Emulsion

STOP RAVAGE OF EARLY PASTURES

THE ENEMY



THE WEAPON To destroy these pests cheaply and effectively, use a combined spray through low volume spray equipment, at the rate of ¼ pint 'Phosfone' 40 and 1 pint 'Pespruf' 20 per acre. For best results spray soon after opening autumn rains.

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Fig. 1.—A battery of sheepskin-covered rollers being used for subterranean clover seed harvesting.

SEED QUALITY

By G. R. W. MEADLY, M.Sc., Officer-in-Charge, Weeds and Seeds Branch

ON many farms in Western Australia, the rolling, threshing and grading of subterranean clover seed is an important and lucrative sideline. An industry that was in its infancy 20 years ago, now employs thousands of men on hundreds of properties in the Great Southern and South-West during the summer months. Last season 2,000 tons of cleaned seed approximating £500,000 in value was produced. Besides the important export trade, clover seed is essential for the establishment of pastures within the State, large quantities being required for the extensive land development at present in progress.

There is quite a deal of confusion in the minds of many purchasing farmers and also some producers regarding the factors that decide the quality of seeds and the requirements of the Seeds Act, particularly as it applies to subterranean clover. In this talk I propose discussing those aspects together with the implications of the certification scheme.

PURITY

The quality of seed is influenced by three main factors—purity, germination and strain. In contrast to the other two, some idea of the pure seed content of a line can be obtained from its appearance, although an analysis must be carried out before it can be expressed in terms of a percentage. The impurities may be either harmless such as grit, broken seeds and stick fragments, or components of real significance such as weed seeds, eggs of insect pests or spores of fungal diseases. Two per cent. of grit sounds only a small proportion but amounts to more than two pounds in every hundredweight and is costly buying at any price. An even smaller percentage of the live impurities can prove much more costly. Agricultural seeds have been responsible for the distribution of weeds to a greater extent than any other medium. The risk is least in thoroughly graded lines but even these should be examined for seed impurities. It is the rule rather than the exception to find seeds of troublesome weeds in poorly graded lines and on occasions such serious species as Cape tulip have been found in thresher samples of subterranean clover seed. Soil particles present can also carry the eggs of red mite and lucerne flea, two of the most troublesome pests of pasture legumes.

Fig. 2.—Gathering and threshing subterranean clover seed in one operation. Sheepskin-covered rollers pick up the burrs and feed them into the threshing machine.

VIABILITY

Although it is important to ensure that no harmful impurities occur in seeds, it is equally important that the seeds are capable of producing strong seedlings. Different species retain their vitality for varying periods. Native wattles have germinated after storage for more than 100 years, while best results cannot be expected with some other plants if sowing is delayed longer than 12 months after harvesting.

The normal life expectancy of seeds can be influenced by a number of factors of which the conditions of storage are not the least important. A dry cool atmosphere is most favourable, and the difficulty of retaining the vitality of stored seeds in tropical countries is due to the high temperature and humidity. Faulty germination may be caused by harvesting immature seed, and mechanical injury giving rise to damaged seedlings is often the result of incorrect adjustment of machinery during threshing and grading. Diseases such as ergot, and insects, including weevils and cutworms, also play their part.

The most widely sown pasture species in this State is subterranean clover and low germination usually can be traced to one of two causes. The burning of the midseason strain to remove the trash before gathering the burrs is likely to damage a proportion of the seed, especially if the dry herbage is abundant and the paddock contains inflammable material such as sticks, manure and rushes. Most of the early Dwalganup burrs are matured in the soil and are seldom damaged by burning but a high proportion of burrs of the midseason strain is located on the surface. It is not unusual for such burning to kill 50 per cent. of the seeds present in the graded line. Most producers are aware of the risk and little burning of midseason pastures is now carried out but any sample having a smell of burnt seeds should be regarded with extreme caution.

The second cause is associated with a natural phenomenon. Subterranean clover seeds as they occur in the soil contain a large number of dormant or "hard seeds" usually amounting to at least 75 per cent. Even under favourable conditions they will not germinate immediately but will give rise to seedlings at varying times over a period of years. With efficient machining this dormancy is broken and a satisfactory immediate germination is possible. A high hard seed content is almost invariably associated with so-called "thresher" or "coaty" lines which have not been subjected to the scarifying process of the "decoater."

An indication of the quality of some subterranean clover seed offered for sale is given by the figures resulting from a test carried out on a sample submitted to the Department by a purchasing farmer. The pure seed content was 78 per cent. with 21 per cent. of inert matter and nearly 1 per cent. of weed seeds. The germination was 34 per cent. with 65 per cent. of hard seeds. Besides the inert matter consisting of sticks, fragments, pebbles and soil particles the sample contained an estimated number of 90 Guildford grass seeds and 45 Cape tulip cormils per pound. The percentage of pure germinable seed was one third that of a satisfactory line and the Cape tulip cormils could well

Fig. 3.—Seed inspection in progress at a seed-cleaning plant.

Fig. 4.—The final stage of seed certification at a metropolitan seed-cleaning plant.

prove a very costly supplement. The seed was offered at 8d. per pound when Government Certified Seed was available for 1s. per pound. It was in fact worth less than 4d. per pound.

THE IMPORTANCE OF STRAIN

The third, but by no means the least important consideration is the strain, especially as seldom can any indication be obtained from the appearance of the seed. Strain variants of the same species can differ in palatability, leafyness, yield, maturity and many other features. Extensive areas in Western Australia have a short growing season and in consequence early maturing strains are essential. In more favoured districts later types—usually more leafy—are desirable.

While purity and germination can be determined in the laboratory, this is seldom the case with the strain, and certification schemes are necessary to define this characteristic of seeds. In Western Australia we are mainly concerned with subterranean clover, and the devolpment of the seed industry in this State has been linked closely with the certification scheme inaugurated in 1934. In that season 70 tons of seed was certified compared with 1,616 tons last year—by far the largest production of any State.

The schemes operating in other States of Australia and also in other countries, vary somewhat in detail but follow the same general pattern. Since its inception, the West Australian scheme has undergone a number of modifications and now includes five strains—Dwalganup, Bacchus Marsh, Yarloop (white seeded), Mt. Barker (midseason) and Tallarook.

Following applications from producers, pasture inspections are made during the growing season in order to define areas free from noxious weeds and of a uniformity of strain satisfactory for the production of Government Certified Seed.

Following harvesting, cleaning and grading, a declaration regarding the origin of the seed is obtained from the producer and a purity analysis is carried out on a sample taken from each sack. If the line contains at least 98 per cent. pure seeds, and is free of serious weed seeds, the sack is sewn and "temporary sealed" with a lead seal, except in the case of the Dwalganup strain to which the permanent coloured metal seal is fixed immediately.

Samples are forwarded to the seed testing laboratory where they are tested for germination and the seedlings examined under ultra-violet light. A trained analyst can detect the difference in fluorescence of the radicle or young root of the two main strains and this observation serves as a further check on the field inspections. If the germination reaches the required figure of 70 per cent. and the ultra-violet light examination is satisfactory the field inspector is authorised to attach the permanent seals to the appropriate sacks. A slip bearing a certificate number and giving details concerning the origin of the seed is included within the sack and a tag bearing similar information attached to the outside. The seed is then ready for disposal and is classed as Government Certified while the sewing twine and seals remain intact.

Fig. 5.—Portion of the large seed-testing laboratory at Palmerston North, New Zealand.

Samples corresponding to the sacks sealed are held for a period of 12 months as referee samples in the event of any disputes regarding quality.

Earlier in this talk I mentioned that seed quality is governed by purity, germination and strain. No doubt you have noted that all three aspects have been considered when standardising seed by means of certification.

The scheme is voluntary but the high proportion of seed now being certified is indicative of its importance to producer, merchant and purchasing farmer.

Let us clarify the position relative to the requirements of the Seeds Act. Although certified seed is specified by most farmers, subterranean clover seed does not have to be certified in order to be sold legally. All seed offered for sale, however, must consist of at least 96 per cent. pure seeds and have a minimum germination of 70 per cent. There are also restrictions on the weed seeds, some being totally prohibited.

It is obvious that there can be many pitfalls when making seed purchases and farmers are urged to buy up to quality rather than down to price. Seeds of all pasture and crop plants are not certified but advantage should be taken of certified lines when they are available. Most merchants are keen to sell high-grade seeds and have their stocks tested for purity and germination at the Department's seed testing laboratory. Ask for these figures when contemplating purchases. Avoid so-called "bargain lines" as, with few exceptions, these are defective in some respect and often prove very costly buying.

(From a broadcast script made available by courtesy of the Australian Broadcasting Commission.)

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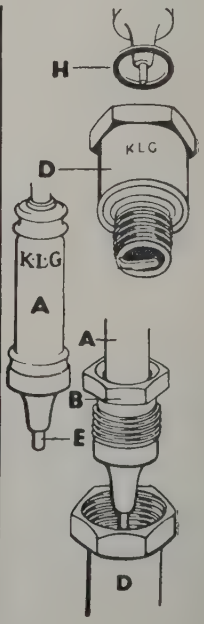

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TWO PROMISING NEW COCKSFOOTS

For Possible Early Release In The Dairying Areas

By F. BRIDGMAN, B.Sc. (Agric.), Agricultural Adviser, and
R. WOODWARD, B.Sc. (Agric.), Agricultural Adviser

FOR many years now the Dairy Division has been testing new varieties of pasture plants, including a number of introductions from overseas and some local selections which might be of value in the dairying areas. In 1950, such testing was intensified and as a result of comprehensive dryland trials at Wokalup and Denmark Research Stations of a series of introductions obtained in that year from the Commonwealth Scientific and Industrial Research Organisation, Division of Plant Industry, Plant Introduction section, a small number of species and strains now appear to be of outstanding promise.

Prominent in these select "plants of promise" are two cocksfoot grasses that appear suitable for some South-West dryland dairying conditions, i.e., those districts where the annual average rainfall is approximately 25in. and over.

This article gives a progress description of these particular grasses—a preview, as is were, of these strains which though not yet available commercially are, nevertheless, now reaching their final stages of testing, and which may be released to farmers shortly.

DESCRIPTION

The names of these cocksfoot are respectively:

(1) Currie cocksfoot—(*Dactylis glomerata* CPI 6845).

(2) Neptune cocksfoot — (*Dactylis maritima* CPI 9003).

These cocksfoots are not to be confused with ordinary cocksfoots available commercially—such as the Danish, Akaroa and Aberystwyth strains. Danish and Akoroa cocksfoots have been tried by farmers in Western Australia for many years with little general success under dryland conditions. Our hot dry summers have not been suited to these strains which originated in cool countries with summer rainfall and it is only in a few selected areas under special conditions that successful survival has been obtained. The Aberystwyth (British) strains S26 and S37 are still under test by the Department but as yet have shown no outstanding promise here and cannot be recommended for dryland planting.

Currie and Neptune cocksfoots, on the other hand, are quite distinct from the above varieties and are from Mediterranean countries where the climate more closely resembles our own.

These two strains have already been proved eminently satisfactory as perennial grass associates for subterranean clover on both hilly country and the foothills area of the Harvey-Wokalup district under dryland conditions. Currie cocksfoot also appears suitable in the Denmark area. It is quite possible that these two grasses may eventually prove useful for wider areas throughout the dairying belt.

Currie cocksfoot would appear to be better generally, than Neptune, being more productive and leafier—but exact trials on this aspect have not yet been completed. Neptune may be suited to slightly drier areas than Currie.

For both varieties it is not necessary that the soil be summer moist nor that it retain moisture longer into the summer than is normal for the dairying areas specified. Their behaviour under irrigation is not yet known as irrigation trials with these grasses have only been started this year.

Currie and Neptune cocksfoot are quite persistent in dryland pasture—having persisted in Research Station Trials without noticeable decline for five years on unirrigated loamy soils of average fertility —soils which could not be in any sense considered summer moist. As yet no trial containing them has been planted for more than this period.

ADVANTAGES AS PERENNIALS

Being perennials, these cocksfoots have the following general advantages in pasture:—

(1) They have considerable autumn and early winter growth and also extend production into the early summer months when the annuals have died down.

(2) They also minimise the infestation of weed species and inferior annual grasses, which tend to dominate old swards of subterranean clover alone.

(3) Their depth of rooting is considerable and greater than subterranean clover.

Discussions of the origins and particular characterstics of these grasses are given below.

CURRIE COCKSFOOT

(Dactylis glomerata CPI 6845).

Origin

In January, 1954, this strain was named Currie after Dr. G. A. Currie, who had collected the original supply of seed in Algeria. From the beginning, it was very promising in C.S.I.R.O. row trials in Western Australia. Subsequently, the Dairy Division obtained seed in 1950 from the C.S.I.R.O. Plant Introduction Section in Western Australia.

Performance and Characteristics

Since then, Currie cocksfoot has been included in numerous Dairy Division trials at both Wokalup and Denmark Research Stations. At Wokalup, Currie cocksfoot has shown outstanding promise in all trials concerned—up to and including the 1953 paddock trials.

At Denmark, Currie cocksfoot has also shown promise. In 1954 it was successfully sown in a seed production area at Wokalup. Also in 1954, it was planted in various other trials on farms throughout the South West dairying districts.

In appearance, Currie cocksfoot is a fairly leafy perennial grass with soft foliage, and generally growing in tufts about 3 to 6in. across at the base or crown. Branch shoots are bunched around, and arise from the base at, or near ground level. In the emerging shoots, leaves are folded along the length of the midrib; when fully emerged the leaves are long, soft and fairly flat with a prominent keel. The leaves are smooth, not hairy. Habit is fairly erect, the plant usually growing to a height of 18 to 24in. before the emergence of the seed stalk and with a full height of 30 to 42in. when the seed stalk has reached its maximum development.

It has a deep well-developed fibrous root system, is free-seeding and appears suitable for mechanical harvesting.

An attractive characteristic of this strain is that, for a perennial grass, Currie cocksfoot can be relatively easily established.

This grass also associates well with subterranean clover.

Currie cocksfoot can survive over summer in dry soils under conditions similar to Wokalup and it can persist for at least five years under moderate grazing by all types of cattle, and even rabbits, without apparent casualty—provided that the pasture is rested for reasonable intervals. In these respects, it is much better than Danish and Akoroa commercial strains of cocksfoot. Recovery from grazing is rapid and vigorous, with the young shoots coming away like a cereal crop.

Lush rapid growth is commenced by established plants as soon as the first soaking rains fall. It has good autumn, and some early winter and spring growth with further abundant production in early summer, the plants lasting green well into January. It thus extends the green growth period by about six weeks as compared with subterranean clover and inferior annual grasses. Associated with subterranean clover which has its main peak of growth in late spring, Currie cocksfoot makes more uniform pasture production possible throughout the grazing season. After January, it dries off with little visible green colour unless unseasonal rains fall.

The time of flowering at Wokalup is generally around mid November to early December, this being earlier than commercial Danish and Akaroa cocksfoots.

Aspects of Currie cocksfoot still requiring further experimental clarification include "perching" or lifting of the crowns and consequent susceptibility to grazing damage. Such "perching" has been observed in young plants in one trial at Denmark planted on a light "fluffy" soil. Proper consolidation of the seed bed during cultivation may reduce this problem on light soils and it should not occur on heavier soils.

In general, Currie is a superior strain of cocksfoot and it is most promising as a perennial grass associate for subterranean clover in the South-West. Trials at the Denmark Research Station suggest that it will be suitable also for the South coastal districts.

NEPTUNE COCKSFOOT

(Dactylis maritima CPI 9003.)

Origin

This species was originally sent from Portugal to the C.S.I.R.O. Plant Introduction section, and after a satisfactory test in their nursery, seed was made available to the Dairy Division.

Performance and Characteristics

Neptune cocksfoot has been promising in Dairy Division trials at Wokalup Research Station. In the Denmark Research Station trials, establishment has been satisfactory, but growth there has not been quite as good as Currie.

Characteristics are generally similar to Currie cocksfoot. Leaves are narrower, are generally more bluish green and retain their lengthwise folds longer. The plants are generally slightly smaller, heights being about 15 to 24in before the emergence of the seed stalk, with a full height of 24 to 36in. when the seed stalk has reached its maximum development.

Like Currie cocksfoot, Neptune is fairly easy to establish, has good competitive seedling vigour, survival over the summer, persistence under grazing, recovery from grazing, usually good early growth after the first rains, and good early summer growth into December. It is fairly productive and leafy (though inferior to Currie in these two characters), associates well with subterranean clover, and is free-seeding. It gives some extension of the green growth period—for about one full month more than usual subterranean clover and ordinary annual grass pastures —though to a lesser degree than Currie. In late summer, it is completely dormant with no green showing at all.

In maturity, Neptune is similar to Currie and earlier than Danish and Akaroa cocksfoot, with the time of flowering generally being around mid to late November at Wokalup.

In 1953, Neptune suffered from rust during the winter—but it later appeared to outgrow this condition quite satisfactorily. In 1954, severe stem rust occurred in November, with leafiness and consequent production being reduced.

Another matter undergoing investigation is "perching." Like Currie, Neptune "perched" or developed lifted high crowns in one trial at Denmark Research Station.

Like Currie, Neptune is a better strain of cocksfoot than either the Danish or Akaroa commercial types in South Western conditions. It gives promise as a perennial grass associate for subterreanean clover in South Western dairying districts.

RABBIT CONTROL.—Use of "1080."

An important policy decision involving the use of "1080" for the control of rabbits was made by the Agriculture Protection Board recently.

The Board decided that the "1080" rabbit poisoning scheme will be extended next year to two projects, one in the Lower South-West and the other in the Lower Great Southern. The exact extent of the projects is not known yet, and will be governed by various factors such as seasonal conditions and the co-operation received.

No difficulty is anticipated where Protection Board Group Vermin Control Officers are employed. In other districts the success of the scheme will depend upon assistance rendered by the local Vermin Boards whose co-operation in arranging itineraries of the units will be essential. It is pointed out that unless simultaneous action is taken against rabbits on all properties the scheme could fail, and it will be necessary for the Vermin Boards to appoint full-time Inspectors (who will be placed under the direction of the Protection Board during the drive period) to ensure a complete coverage.

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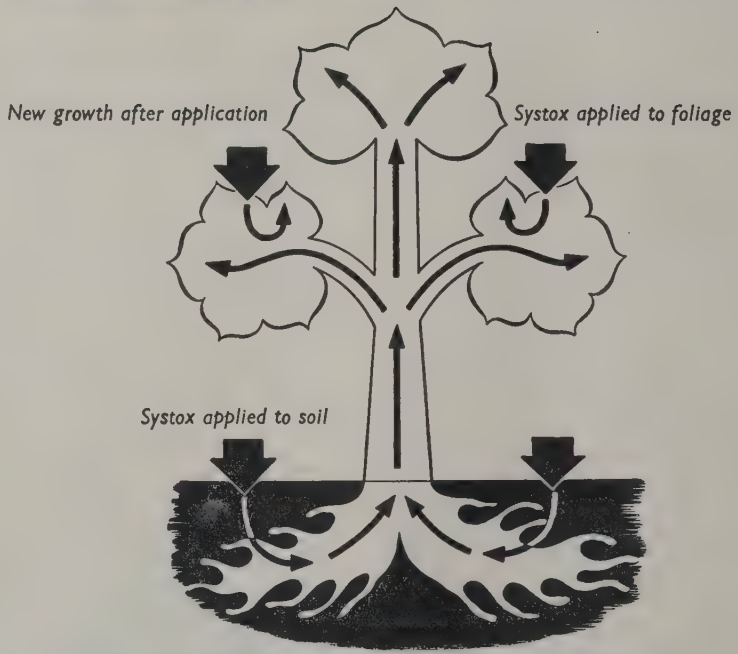

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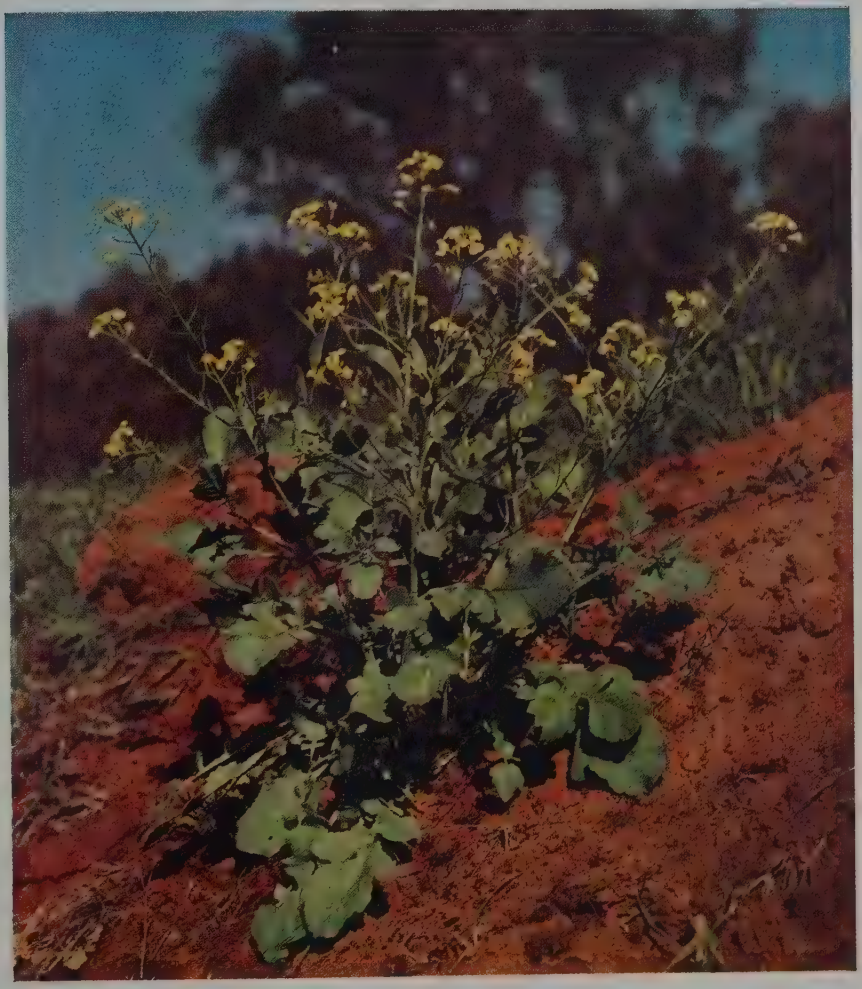

WILD RADISH

(Raphanus raphanistrum L.)

Wild Radish is one of the most cosmopolitan of weeds. Regarded as being native to Europe it is now naturalised in most temperate countries of the world and is troublesome in both crops and pastures. The 2,4-D, or hormone-like herbicides, have assisted greatly with its control.

WEEDS of Western Australia

By **G.R.W. MEADLY** M.Sc.
Officer in Charge, Weeds and Seeds Branch

WILD RADISH

(Raphanus raphanistrum L.)

WILD Radish is regarded as a native of Europe, but is now naturalised in most countries of the world having a temperate climate. In England it is one of the most troublesome weeds of arable land and has been responsible for large reductions in the yields of cereals. It has found its way to the Americas, is widespread in New Zealand and occurs in every State of Australia.

In Western Australia, Wild Radish followed rapidly on the heels of agricultural development and details of its early history are obscure. It is now widespread and thoroughly established over a large portion of the State, being particularly troublesome in the Victoria district, especially on the flats in the vicinity of Geraldton and Dongara.

Although normally a winter and spring growing annual, under favourable moisture conditions germination may occur in the summer. Under such circumstances mature seeds are often produced when the plants are quite small. The growth of the weed is favoured by substantial early rains but, at the same time, an abundant early germination facilitates control measures. Wild Radish occurs on a variety of soils but is of greatest consequence on the rich heavier types.

CORRECTION.

In the coloured plate of Noogoora Burr in the January-February issue, the botanical name of the weed was wrongly given as *Xanthium spinosum* L. Noogoora Burr is *Xanthium pungens* Wallr. The related species Bathurst Burr is *Xanthium spinosum.*

DESCRIPTION

The vernacular name is readily understandable as Wild Radish belongs to the same genus, *Raphanus,* as the garden radish and the root, although not developed to the same extent, has a similar flavour. It is often erroneously regarded as being a degenerate type of the garden plant.

Wild Radish is an erect or spreading annual (rarely biennial) usually two or three feet in height but, under favourable conditions reaching six feet. It is much branched with a few short transparent hairs on the main stem. The lower leaves are pinnately divided or lobed, the upper segments being large and soft while the lower are smaller. The upper leaves are usually smaller and entire.

The flowers, about three-quarters of an inch long, are white or pale yellow with purplish veins. The cylindrical pod varies from one to more than 2in. in length and has a terminal beak. It is restricted between the seeds giving the appearance of a short string of beads and breaks, when ripe, into one-seeded segments.

SIGNIFICANCE

Wild Radish and the related wild turnip are two of the most widespread and troublesome weeds of cereal crops in Western Australia. Wild Radish is re-

WILD RADISH

A—Foliage; B—Flowering stem; C—Flowers; D—Seed pod; E—Seed.
(From a pen drawing by C. A. Gardner, Government Botanist.)

Fig. 1—The effectiveness of the hormone-like sprays in the control of Wild Radish is illustrated by the dense growth of the weed on an unsprayed strip in a crop near Northam. The sprayed portions are practically free from infestation.

cognised by farmers as having some forage value and for this reason, in many cases, control rather than eradication is desired. It is a vigorous competitor for both crops and pastures, however, and many crops have been left unharvested due to the smothering effects of this weed. Harvesting is also made more difficult by the presence of the fibrous stems, involving repeated choking of the comb.

When eaten by dairy cows, wild radish has caused a taint in milk, and the seeds, if ingested in considerable quantities, may cause poisoning. This is only likely to occur if a concentrate such as screenings containing a high proportion of Wild Radish seed is fed to stock.

CONTROL

The widespread incidence of Wild Radish can be attributed to its distribution as an impurity in hay, chaff and grain. Seed oats containing Wild Radish has been responsible for its initial introduction to many districts.

Wild Radish has several characteristics which accentuate its significance as a weed and add to the difficulties of control. It seeds freely and the seeds which, as already mentioned, are retained in segments of the fruit may remain in the soil in a viable condition for many years. Paddocks on which little, or no Wild Radish has been seen for ten years or more, often become infested with this weed following ploughing, which brings dormant seeds to the surface and stimulates germination.

Wild Radish is likely to be most troublesome in late seasons when there is often little opportunity to cope effectively with the weed by cultivation before sowing the crop. Although there is a flush of germination following the first substantial rain, seedlings continue to occur over a period, adding to the control difficulties. Fortunately, with the advent of the hormone-like herbicides, Wild Radish is not nearly the same problem, in fact it is now possible to sow dry in late seasons and still feel confident of effectively controlling the weed. It is eaten readily by stock, particularly when the plants are small, and grazing, especially with sheep is a useful control measure.

During the past five years, several different chemicals belonging to the hormone-like group have been used extensively in Western Australia for the selective control of weeds in cereal crops. Although results from the application of all these chemicals to wild turnip have been uniformly good, in a number of cases, particularly with aerial application, the control of Wild Radish has not been satisfactory. In 1953 the Department under-

took some detailed experimental work to compare the chemicals being used and to ascertain the value of others for the control of Wild Radish. At that time most of the spraying was being undertaken with the amine and sodium salt of 2, 4-D and the sodium salt of M.C.P.A. These were included in the treatments along with two different types of 2, 4-D ester one of which was less volatile than the usual type and therefore has less risk of damaging nearby susceptible crops.

Cereals are known to be less tolerant to both these preparations, however, and results had to be gauged on the effects on the cereal as well as the weed. At the time of spraying the wheat was about 8in. high and stooling. There was a moderate to heavy infestation of Wild Radish at the rosette stage with leaves 6 to 8in. in length. All chemicals were applied at the rates of four and six ounces of acid equivalent in five gallons of water per acre.

The four ounces of acid equivalent per acre of M.C.P.A. and 2, 4-D amine affected a proportion of the Wild Radish plants but did not give a satisfactory degree of control. The six-ounce rate of both gave reasonable control although some plants recovered and set seed. There was no apparent difference between the two types of ester but the results with four ounces were conspicuously better than with six ounces of amine and M.C.P.A. The six-ounce rate of the esters gave complete control of the Wild Radish without affecting the yield of grain.

As a result of this experimental work, the Department favours the 2, 4-D ester for the treatment of Wild Radish in wheat. For general control purposes, providing conditions are favourable, four ounces of acid equivalent per acre is recommended. When complete control is desired or application is being made by aircraft, six ounces should be applied.

When a crop is undersown with a legume, the suspectibility of the species used must be taken into account. Although some information is available, we do not possess the full story, and tolerance trials with barrel medic and Dwalganup subterranean clover are being continued. It is known that generally legumes are less affected by M.C.P.A. than by the ester of 2, 4-D with the amine in an intermediate position.

Experiments and observations so far indicate that subterranean clover will withstand rates of at least eight ounces acid equivalent per acre of the various types including the esters but in a number of instances a delay in the flowering time has been noticed. Delayed flowering means late seeding and in short seasons this could mean that the soil may not remain moist long enough for seed formation to take place. Under such circum-

Fig. 2.—A wheat crop containing Wild Radish at the growth stage most suitable for effective spraying.

stances, old pastures would normally be re-established the following season from hard seeds in the soil but such a reserve would not exist in the first year of sowing. With first-year stands of clover in crops the decision regarding spraying of

Fig. 3.—The first reaction of Wild Radish to hormone-like sprays is a twisting and "propping" of the foliage.

weeds can be difficult. By using six ounces acid equivalent of M.C.P.A. per acre maximum control of Wild Radish cannot be expected but the risk of seriously affecting the clover is slight.

The best time for spraying is influenced by the growth stage of both crop and weeds. It is possible to affect cereal yields by treatment at susceptible stages. The recognised "safe period" for wheat is between stooling at 6 to 8in in height and the early "boot stage" when the head is enclosed in the sheath of the flag leaf. Risk of damage continues during pollination but resistance again increases at the late "milk" and "soft dough" stages. We have had little experience with spraying weeds in oats and barley but it is known that oats is a more sensitive crop than wheat, with barley intermediate. Depression of yield with oats has occurred even with spraying carried out at the time considered most appropriate for wheat.

Weeds should be sprayed when small as they are then most vulnerable to the chemical and are also destroyed before becoming an important competitor for the crop. Furthermore, the cereal then provides the weed with little protective coverage from the chemical. When the wheat crop is at the beginning of the "safe period," that is 6 to 8in. high, usually most of the weeds such as Wild Radish and wild turnip have germinated but are still relatively small and susceptible. By the time the weeds have commenced flowering, they have competed for some time with the crop for moisture and nutrients and will soon present a harvesting hazard by topping the crop.

Late spraying has been carried out with a view to causing large plants of radish and turnip approaching maturity to recede below the level of the crop and thus facilitate harvesting. This procedure does not take full advantage of the treatment, however, and can only be regarded as an emergency measure which may not always pay dividends. Grain setting can be affected by the chemical and unless applied by aircraft, considerable mechanical damage to the crop can occur when spraying is done so late in the season.

Although a low-volume spray unit is a relatively simple machine, it is required to do an accurate job. The even application of six to eight gallons of solution per acre seemed somewhat fantastic a few years ago but is now accepted as commonplace. It means, however, that the equipment must be in first class condition. The volume applied depends on the type of nozzle, the pressure at which the pump is operating and the travelling speed of the unit. Output tables are supplied for the various nozzles and providing the pressure and speed are maintained, the rate of application is usually satisfactory. It is advisable, however, to check from time to time the volume actually applied to a given area as, for various reasons, calculated rates can go astray. There is really no margin for error when four ounces of active chemical are being supplied per acre.

Strips of Wild Radish and turnip in crops draw attention to the necessity of clearing nozzles as soon as they become blocked.

PROTECT YOUR HOME AGAINST BUSH FIRES

ONCE again this year bush fires have swept through Australia, leaving in their wake a trail of loss and destruction; once again rural dwellers are courageously setting about the task of rehabilitating their properties and rebuilding their homes. Letters received by the Building Research Liaison Service have asked what special precautions can be taken to protect a house against bush fire, and in this article an attempt is made to answer the question.

A study by the Divison of Forests Products, C.S.I.R.O., of the houses destroyed in the disastrous Beaumaris fire in January, 1944, revealed that the greatest hazard to guard against is the entrance of sparks and flying embers through openings, such as eaves, ventilators, open windows, and the space under the house. Where this occurred, the fire started inside the house, which was speedily destroyed, regardless of the material of its external walls. Brick and stone houses fared no better than timber houses.

The problem facing the home builder is to protect himself against this hazard, while still retaining the living comfort derived from adequate ventilation, and while still providing access under the house for regular inspection against termite attack.

The following represent the modifications to normal building practice which are recommended in order to reconcile these apparently conflicting requirements:

Timber houses, and, in fact, all houses supported on stumps, should be close-boarded below floor level. Adequate under-floor ventilation should be provided by woven wire vents, and an access door should be provided.

All wall ventilators should be of the woven wire type or else they should be covered by a fine wire mesh. Large ventilators in gable ends should be eliminated and replaced by a number of scattered small ventilators with fine mesh openings.

Eaves may be open for maximum ventilation, but the openings should be covered with ¼in. wire netting.

Badly fitting Marseilles pattern tiles should be avoided. Close-fitting sheet roofing is preferable, and the joints should be sealed.

The spaces under corrugations of sheet roofing at eaves, ridges, hips and valleys should be covered with fine mesh wire netting.

Fly-wire protection should be given to all door and window openings.

In addition to the above, the following rather obvious precautions must be taken: Keep trees and shrubs clear of the walls, and stacks of fuel well clear of the building or stored in properly constructed sheds.

Consideration should also be given to the use of a non-combustible material, such as bricks (where available), concrete blocks, or earth wall construction for the walls. The last-mentioned material has long been used sucessfully for houses and farm buildings in many country areas, and where the right type of soil is readily accessible, and self-help labour is available, it can be a very economical form of construction.

(Compiled by the Building Research Liaison Service P.O. Box 2807AA, Melbourne, to which enquiries for further information on this subject may be addressed.)

ANIMAL QUARANTINE

By C. R. TOOP, B.V.Sc., Chief Veterinary Surgeon

TO the farmer who has experienced losses from entero-toxaemia, footrot, mastitis or toxic paralysis—to mention only a few of the conditions which affected livestock in this State—it might be thought that Western Australia is a country ridden with disease and he would perhaps be surprised to learn that he lives in one of the healthiest countries for livestock in the world.

Ever since the earliest days of settlement, Australia has remained almost free from the great animal plagues and highly infectious diseases that have impoverished other countries, and any that have been introduced have been promptly stamped out before they have had time to become established.

This has not been just a matter of chance, but has been due largely to the constant vigilance of the quarantine services coupled with the fact that Australia is completely isolated by sea from all other countries. Legislation requiring all importations to be made by sea has provided a further safeguard.

Since the incubation period of most of the diseases likely to be introduced would be exceeded by the duration of the voyage, a disease present in the incubation stage at the time of shipment would declare itself in the form of symptoms which would be recognised by the time the animal reached its destination in Australia. As a further precaution, imported animals are detained at a quarantine station for prescribed periods after landing where they are kept under close observation and may be subjected to various treatment and diagnostic tests.

AIR TRANSPORT A DANGER

During recent years the security we have so long enjoyed has been endangered by the speed of air transport, and to meet the situation the importation by air of animals and products of animal origin likely to carry disease has been prohibited.

The importation of animals and their products into Australia is controlled by the Commonwealth Quarantine Act which is administered by the State Veterinary Services. Proclamations under this Act prescribe the countries from which importations may be made and the classes of animals that may be imported and there are regulations which define the conditions to be observed when importations are permitted.

All this is based upon an intimate knowledge of the world disease situation and, while an animal may be introduced from one country without risk, its introduction from another would be fraught with great danger. Thus certain classes of animals may be admitted from New Zealand, Britain and North America with complete or reasonable safety, whereas because of the risk of disease the importation of animals of every description from Europe, Asia, Africa and South America has been totally prohibited. Severe import restrictions are necessary for the protection of our animal industries so that at the present time cattle may be imported only from New Zealand, Britain, Canada and the United States; horses, dogs and cats only from Britain and New Zealand; sheep, poultry and birds only from New Zealand and pigs only from New Zealand and Ireland.

PRODUCTS OF ANIMAL ORIGIN

It is also necessary to exercise a strict control over the introduction of animal products such as hides, skins, meat, eggs, stock foods and fertilisers, straw packing and second-hand bags and, depending upon

the country of origin and the disease risks involved, either to prohibit their importation entirely or to admit them subject to conditions which will ensure freedom from infection.

FOOT AND MOUTH DISEASE

The disease we have reason to fear more than all others is foot and mouth disease which occurs in all countries of the world other than Australia, New Zealand and North America. It affects cloven-hooved animals, is highly contagious and spreads with great rapidity. The infection may be disseminated both by affected animals and materials contaminated by their discharges, and the virus is able to survive for long periods in meat and hides.

Should foot and mouth disease ever reach Australia, it would most likely be introduced with meat brought into the country without authority by migrants, and the initial outbreak could be expected to occur in pigs from which the infection would soon be spread to sheep and cattle. The seizure and destruction of raw sausage and other meat products found in the baggage of migrants at Fremantle or intercepted at the Post Office is almost a daily occurrence and it is not difficult to visualise what the consequences might be should any of this material pass beyond quarantine barriers and find its way into garbage fed to pigs.

An outbreak of foot and mouth disease in Australia would be little short of a national disaster, not only because of the great losses it would inflict upon our livestock industries and the enormous cost of eradication, but also because of the embargoes which would be certain to be placed upon our export products. Its eradication would mean a policy of quarantine and ruthless slaughter and while this would be difficult enough in the settled areas it would present an almost insuperable problem should the disease extend to the pastoral countries.

SOME GRIM EXPERIENCES

Rinderpest, a highly infectious disease of cattle with a mortality rate of about 90 per cent., was introduced into Western Australia in 1923. Fortunately it did not spread beyond the metropolitan area, but to effect its eradication it was necessary to slaughter and burn 1,500 dairy cows and to pay out £60,000 in compensation. The first outbreak occurred on a dairy at Fremantle and the infection is presumed to have been introduced with garbage or manure landed from an overseas vessel carrying live animals as ship's stores. As the result of the lessons learned from this experience live animals such as cattle, sheep and pigs carried on foreign ships as stores are no longer permitted to be brought into Australian ports and ships' garbage cannot be landed except for the purpose of immediate destruction. At Fremantle it is loaded on to barges and taken to sea and dumped.

The swine fever outbreak of 1942 is still fresh in mind. This disease was brought to Australia in pig meats landed by the American forces, scraps of which were afterwards fed to pigs with unboiled garbage and before it was finally eradicated it was responsible for the death or destruction of 13,000 pigs on 123 properties.

About two years ago an embargo was placed upon the importation of sheep from Britain following upon an outbreak of scrapie in a consignment of stud sheep which had been landed in Victoria 12 months previously. Scrapie is caused by a virus which attacks the central nervous system producing symptoms of incoordination of movement, wasting and intense skin irritation and it is invariably fatal. The incubation period is prolonged sometimes extending over two or three years so an early lifting of the ban is not to be expected.

The horse population of Australia is singularly healthy, but importations from countries other than New Zealand or Great Britain could result in the introduction of many infectious diseases the more serious of which are transmitted by biting insects such as March flies, stable flies, ticks and mosquitoes. Amongst these are included a large group of diseases caused by blood parasites known as trypanosomes of which surra is an example and the virus diseases infectious anaemia (swamp fever) and infectious encepholomyelitis or "sleepy sickness" which is also transmissible to man.

Insects capable of transmitting all of these diseases are present in Australia, so that once introduced they would become permanently established.

In the case of dogs, special precautions must be taken to exclude rabies, popularly known as hydrophobia. The virus of the disease is present in the saliva and it may be spread by the bite of the rabid dog to other animals and man. Cases of rabies are always fatal and death in most cases occurs within three days of the onset of symptoms.

Should rabies ever become established in Australia it could be expected to spread to foxes and dingoes and the prospects of eradication would then become remote. This is the case in other countries where foxes, wolves, jackals and even the vampire bat have kept the infection alive.

Because of the wide distribution of rabies importations are allowed only from Britain and New Zealand and no dog from Britain is admitted unless it has been located in that country for six months prior to shipment and as a further precaution it is held in quarantine for 60 days after landing in Australia. This is necessary to cover the incubation period which may at times extend to nine months.

The indiscriminate importation of poultry and birds could result in the introduction of Newcastle disease with disastrous consequences to our poultry industry. This condition is extremely infectious and in some outbreaks the mortality rate has approximated 100 per cent. The domestic fowl is also a reservoir of the virus of equine encephalomyelitis or sleepy sickness.

These are only a few examples of the exotic diseases we have reason to fear—there are others no less serious—and the greatest vigilance on the part of quarantine and disease control officers and stock-owners alike will be necessary if we are to continue to exclude them.

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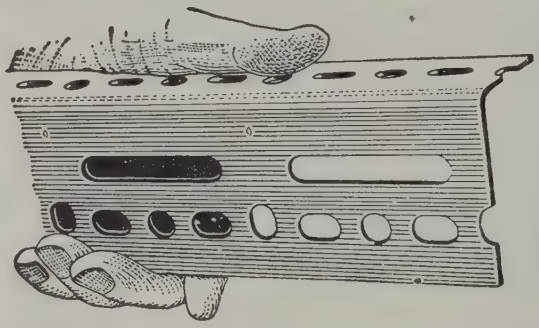

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PHOSPHORUS SUPPLEMENTS FOR DAIRY COWS

By L. C. SNOOK, D.Sc., Animal Nutrition Officer

TO ensure continued high milk production and good health it is essential that dairy cows should receive adequate supplies of phosphorus in their food. For many months of the year, typical Western Australian pastures do not contain sufficient of this essential element. If the farmer fails to provide the correct form of mineral supplement the cows cannot produce milk to full capacity, or they deplete their bodily reserves with resultant ill-health. In either case the farmer suffers financial loss.

Recent studies have shown very clearly that many cows in our South-Western dairying districts are suffering from a real or incipient phosphorus deficiency. This must certainly affect milk production, and may also reduce resistance to disease and be one explanation of seasonal infertility. Even on the best of winter pastures it seems that productive cows cannot make good the losses in phosphate suffered during the summer, when dry feed relatively deficient in phosphorus forms the bulk of the diet.

Fig. 1.—Cow No. 33, an experimental cow in its fourth lactation under test. This was the best of the control cows (no phosphatic supplement) in 1952 and 1953. She has received a phosphatic supplement since 18/3/54.

In her 1953-54 lactation of 277 days she produced 8,309 lb. of 3.8% test milk for 313 lb. butterfat, or 1.13 lb. butterfat per day.

In her 1954-55 lactation (incomplete) of 242 days she produced 9,196 lb. of 3.5% test milk for 322 lb. butterfat, or 1.33 lb. butterfat per day.

It is well known, of course, that, as pasture plants mature, the phosphorus content falls, but very few realise just how serious this fall can be to the milking cow. Even good quality meadow hay cut from excellent South-West mixed pastures does not contain enough phosphorus. The present indications are that not only should dairy stock of all types receive phosphatic supplements during the summer months but that supplements should be fed to milking cows during the winter as well, as it is during this time that lactation imposes the maximum drain on the mineral reserves.

There is no justification for the assumption that phosphatic supplements are unnecessary when the pastures have been heavily topdressed with superphosphate. High producing dairy cows cannot eat enough pasture to satisfy their phosphorus requirements.

POSSIBLE PHOSPHATIC SUPPLEMENTS

Bonemeal.

Sterilised bonemeal has for many years been the standard source of phosphorus for use in stock foods and mineral licks. Bonemeal is an excellent supplement in that it supplies not only phosphorus but presumably all the other essential minerals which have been used to build sound healthy bone.

Bonemeal is commonly made available to stock mixed with an equal weight of common salt. The mixture can be placed in boxes set up in convenient places in

the paddocks. Some sort of shelter to keep out the rain is necessary. This method of supply has a number of disadvantages, however. Consumption of the lick is variable and uncertain; some cows eat a lot, others none at all. In practice these salt boxes are often neglected by both the stock and the owner.

Mixing the bonemeal with a palatable foodstuff is much to be preferred, as the farmer can then be sure that all animals consume their quota. This is relatively easy where the cows are bail-fed, that is if the cows will eat food containing bonemeal. It is unfortunate that bonemeal can make rations so unpalatable to some cows that there are many dairymen who refuse to use it. Because of this, and because only limited supplies of bonemeal are available, other sources of phosphorus are recommended.

Average milking cows should receive about two ounces of bonemeal per head daily. The requirements will vary according to milk production and the quality of the grazing. Good cows should receive up to four ounces of bonemeal daily. Heifers on dry feed will grow better and conceive more readily if bonemeal is made available.

Boneflour.

This consists of the mineral residue from bones which have been extracted in the preparation of products such as gelatine. It is sold as a fine whitish powder which has very little odour and can easily be mixed with other foodstuffs. It is a popular and useful supplement but has the disadvantage that regular supplies cannot be guaranteed. Boneflour is used in the same quantities as bonemeal.

Di-calcic Phosphate.

This is prepared from phosphatic rock and in pre-war years was used in considerable quantity. It is an expensive source of phosphorus, however, because of the difficulties of manufacture. The further use of di-calcic phosphate is not recommended.

Superphosphate.

Following the field trials described in a previous publication (Snook, 1949) superphosphate has become quite a popular source of phosphorus for livestock. Previously, superphosphate had received little consideration for direct use as a mineral supplement although it was cheap and readily available. This neglect was chiefly due to the assumption that the fluorine present would prove toxic. I have considered this factor carefully and field trials to date have supported my contention that superphosphate is a safe source of phosphate for livestock if used as recommended in this article—

Untreated Superphosphate.—The mixing of dry superphosphate with other foodstuffs, or in mineral licks is **NOT** recommended. Half the bulk of commercial superphophate consists of calcium sulphate or gypsum, an inert, unpalatable substance of no food value to animals. A certain amount of calcium fluoride is also present (about 0.7 per cent. F.). The gypsum and some of the fluoride can, however, readily be separated from the valuable water soluble calcium phosphate by mixing the superphosphate with water. The useless materials quickly sink to the bottom of the container leaving the phosphate in the clear solution above. There is no point in using "straight super" when a purified product can be prepared so simply.

Superphosphate in the Drinking Water.—During the summer of 1948-49 tests were carried out to determine if the phosphorus requirements of dairy cows could be supplied by adding superphosphate to the drinking water. This method has become quite popular and is now widely practised where stock have to drink water which can be treated. Up to 5 lb. of superphosphate can be added to every 100 gallons of water without reducing the palatability. On most farms the use of 3 lb. of superphosphate in every 100 gallons of water is adequate, if the treatment is maintained throughout the summer. At this rate of supplementation a cow drinking the usual ten gallons of water daily will obtain as much phosphorus as is present in 3½ oz. bonemeal. A cow on this intake throughout the summer will calve down in the autumn with an abundant reserve of phosphorus, in contrast to the depleted condition so commonly seen. This should encourage maximum milk production and reproductive efficiency.

Methods of Using Superphosphate in the Drinking Water.—The methods used to supply water treated with superphosphate will vary according to conditions. On the properties, where the tests were made stock are watered from concrete containers holding about 600 gallons, which are kept filled by the use of ball-cock taps. These large containers are treated by adding daily one pound of superphosphate for every three cows drinking from the trough, on the assumption that each cow will drink about 10 gallons of water daily. It would be more exact and fool-proof, of course, to treat a container full of water by adding 3 lb. superphosphate per 100 gallons, using this, refilling, and again treating with superphosphate.

Fig. 2.—Cow No. 51. This was the second best producer in the control group during the first year under test, producing 278 lb. butterfat in her first lactation. Production declined to 238 lb. and 190 lb. in the succeeding two lactations. This cow has received a phosphatic supplement since 18/3/54 and promises to be one of the highest producers in the herd. In the first three months of the current lactation she produced 198 lb. butterfat (an average of 2.2 lb. a day).

Some farmers are adding the superphosphate to the large tanks from which drinking water is reticulated. The necessary periodic removal of the gypsum from the bottom of the tank may prove difficult. Perhaps this could be avoided if the required amount of superphosphate is mixed with two or three times its weight of water (5 lb. superphosphate to one or two gallons) and left to settle. The clear supernatant fluid will contain most of the phosphate and this could be decanted into the tank. The sludge should then be washed with another lot of water to extract some of the remaining phosphate. Doubtless many modifications will be used but there seems no obvious obstacle to the wide use of treated drinking water. This would permit all stock to build up their phosphate reserves during the summer months when normally the reserves of this mineral are being depleted. The possibility must even be considered that if the cows freshen in the autumn with adequate reserves there may be no need for further supplements while good quality green feed is available.

One possible disadvantage may be mentioned. The addition of phosphate to the drinking water encourages a prolific growth of green algae and similar water plants. This growth is not necessarily harmful but it may offend those who like to keep the water troughs clear of plant growth.

Concentrated Solutions from Superphosphate.—Treatment of the drinking water is of little use during the winter months or where alternative water is freely available. A concentrated solution of water soluble phosphate can be prepared, however, by thoroughly mixing superphosphate with water at the rate of 5 lb. per gallon, i.e., with double its weight of water. The clear solution obtained when the mix is left to stand is very rich in phosphate, one pint containing as much phosphate as 6 oz. bonemeal. It is of interest to note that very little fluoride remains in solution, all but a trace being precipitated with the gypsum sludge. The concentrated solution is now widely used to damp down food fed in the bails, as half a pint per head daily constitutes a very worthwhile supplement. It can also be used to damp down meadow hay or chaff fed to cows in the field. Farmers report that stock prefer the treated hay. If hay could be sprayed with the concentrated solution as it was being stacked, the phosphorus requirements of the stock eating the fodder could be assured.

The concentrate is particularly useful when only a little food is given in the bails. Some farmers, for example, use only enough bran or pollard to soak up the fluid added and the cows eat this readily. By attaching small feeding boxes to the doors or sides of walk-through bails cows can be given their supplement even though the rate of passage through the shed is rapid.

Preparation.—Superphosphate should be added to water at the rate of 5 lb. per gallon. Mix thoroughly with a stick and then pour from bucket to bucket about six times. Where the containers are too large to do this, stir thoroughly from top to bottom using a mixer made like a cream stirrer.

When all the water-soluble phosphate has been dissolved further stirring is unnecessary. In practice, however, it may be an advantage to have two or three containers which can be used in rotation. If these are placed in a handy position it is not much bother to give them all a thorough stir once a day.

On being left to stand, the undissolved material quickly settles to the bottom leaving a clear fluid which can be dipped off as required. The sludge on the bottom should be thrown on the manure heap before the next batch is prepared. Some phosphate will remain in the sludge so this should not be wasted.

Testing Strength of Solutions.—Obviously a certain amount of mixing is essential to make sure all the soluble phosphate has gone into the solution, but no one wants to waste time stirring unnecessarily. By using an hydrometer to measure the specific gravity, the strength of the solution can be read in a matter of seconds. Suitable hydrometers with a long, easily-read scale from 1.000 to 1.200 can be purchased for about 14s. A saturated solution gives a reading of 1.100. If the value is much less than this either more stirring or more superphosphate is needed.

Effect on Metal Containers.—Although the saturated solution is strongly acid in reaction, it does not appear to be actively corrosive. Apparently a film of iron phosphate is formed on iron surfaces and this may be protective from, rather than inducive of rusting. Kerosene tins and galvanised buckets have been used at this laboratory without apparent damage. No reports have been received of damage following the use of superphosphate solutions in galvanised iron tanks and water troughs. Comments from farmers regarding this are invited.

ROCK PHOSPHATE

This is the cheapest source of phosphate and assured supplies can be obtained from the superphosphate manufacturers in the form of a finely ground, odourless, tasteless powder. Unfortunately phosphatic rocks contain fluorine which can accumulate in the tissues of animals and eventually produce toxic effects. Because there is a worldwide shortage of bonemeal many efforts have been made overseas to find a way of using ground rock phosphate in stock foods. On account of the high fluorine content of the phosphatic rocks tested in South Africa and the U.S.A., however, it is now generally accepted that the risk of toxic effects is too great to justify their use as a direct source of phosphate for livestock.

Fig. 3.—These twin Jersey heifers, A12 and A13, are believed to be identical twins. They calved in 1954 and are receiving identical treatment during their first lactation. Average production per day has shown a striking similarity as follows:—

A12—20.0 lb. milk; 4.94% test; 0.99 lb. butterfat.
A13—20.0 lb. milk; 4.90 % test; 0.98 lb. butterfat.

If this evenness in production is maintained, one of the twins will probably be transferred to the control group at its next lactation.

The rock phosphate imported into Western Australia for the manufacture of superphosphate comes from Christmas Island (in the Indian Ocean south of Batavia). It so happens that this rock contains much less fluorine (1-1.7 per cent.

F.) than the phosphatic rocks available in most other countries (these generally contain more than 3 per cent. F.) It seems that advantage should be taken of this fortunate circumstance and tests have therefore been made to see if it is safe to use Christmas Island rock as a direct source of phosphate for animals.

In August 1950 trials were commenced at the Bramley Research Station to test the effect of continuous feeding. Ground rock phosphate from Christmas Island has been given to mature milking cows at the rate of 4 ounces per head daily. A heifer born to one of these cows was likewise placed on the supplement when 15 months of age and is now in its second lactation. A number of heifers have been added to the experiment during the last 12 months. No toxic effects have been observed in these cows or their progeny: in fact they all look particularly healthy and production records are well above average. Full details of this work will be described elsewhere. Of more significance, perhaps, are the results being obtained in a number of commercial herds where ground rock phosphate from Christmas Island has been fed to the cows in milk for over three years, the ration being three ounces per head daily. Milk yields and conception rates have shown a marked and consistent improvement and these responses suggest that tentative recommendations can be made concerning the use of Christmas Island ground rock. The following limitations must be appreciated, however.

(i) The recommendations here being made apply to phosphatic rock from Christmas Island. At present West Australian supplies are obtained exclusively from this source.

(ii) The tests on which these recommendations are based were carried out in the south western corner of the State where the drinking water and the pasture has a low fluorine content.

(iii) Fluorine is a cumulative poison and if ground rock phosphate is fed to excess over an extended period dairy cows may lose their appetite, become unthrifty, and eventually suffer from damage to the teeth and the skeleton.

(iv) Young animals are more susceptible to excessive fluorine than are mature animals, hence rock phosphate should not be fed to calves or yearlings if some other source of phosphate is available.

(v) On properties where supplementary feeding in the bails is continued throughout the year it may be wise to withdraw the ground rock phosphate from the concentrate mixture for three months in each year.

Methods of Feeding Ground Rock Phosphate.

In Concentrate Rations.

(a) Add it to the bulk mixture used in the bails, so that each cow receives 2-3 ounces of ground rock phosphate in the daily ration.

(b) Use a pepper tin or some such measure to add to the appropriate amount of the ground rock phosphate to the food given to each cow.

(c) Use one of the following mixtures:—

(i) Ground rock phosphate, 100 lb.; Stock salt, 50 lb.—Maximum per cow per day—4½ oz.

(ii) Ground rock phosphate, 100 lb.; Boneflour or bonemeal, 100 lb.; Stock salt, 50 lb.—Suitable for highly productive cows where it is desired to lesson the risk of feeding excess fluorine. Up to 5 ozs. per head daily should be quite safe.

(iii) In coastal areas add 1 oz. of cobalt chloride or cobalt sulphate to each 100 lb. of lick prepared as under (i) or (ii).

(iv) Ground rock phosphate, 100 lb.; Denmark Lick, 50 lb.—Maximum per cow daily—4½ ozs. This is an easy way of adding cobalt and copper and common salt to a phosphate lick.

In Lick Form.

Any of the mixtures given in (c) above can be fed to stock in the form of licks. Consumption rates may be high when the licks are first made available but after a while it will be found that the amount eaten will not exceed the recommended intake. Palatability can be controlled to a considerable degree by using more or less salt. With cattle the problem is often one

of enticing the stock to eat enough lick. Molasses can sometimes be used with advantage to increase palatability and to produce a crumbly texture which facilitates handling.

It is suggested that licks containing ground rock phosphate should be fed for only six months of the year, e.g. during the summer months. This should eliminate any danger of excess fluorine being accumulated in animals with an excessive fondness for salt licks.

Fig. 4.—Cow No. 3. This mature grade cow was purchased with the property when the Bramley Research Station was established. Since August, 1950, she has been fed 4 oz. of ground rock phosphate daily. She appears to be in excellent health and her calves have been healthy also. Her production figures for the period are:—

	Milk	Test	Butterfat
1950-51	8,060 lb.	3.71%	299 lb.
1951-52	7,500 lb.	4.49%	337 lb.
1952-53	12,019 lb.	4.21%	506 lb.
1953-54	9,400 lb.	4.51%	423 lb.

Phosphatic Supplements—Cost Per Unit of Phosphorus

Retail Prices, Perth, February, 1955.

Material.	Purchase Price.	Cost per 100 lb.	Phosphorus Content (per cent. P.).	Cost per unit of phosphorus.
		s. d.		
Superphosphate	£13 2s. 9d. per ton	11 9	8 (water soluble)	17s. 6d.
Bonemeal	44/6 per 125 lb. bag	35 6	12 (total)	3s. 0d.
Bonefiour	£2 10s. 0d. per 125 lb. bag	49 0	14 (total)	2s. 10d.
Ground rock phosphate *ex* Christmas Island	£10 12s. 6d. per ton	9 6	17 (total)	7d.

Reference.

Snook, L. C. (1949), Journal Department Agriculture, Western Australia, 26, 169.

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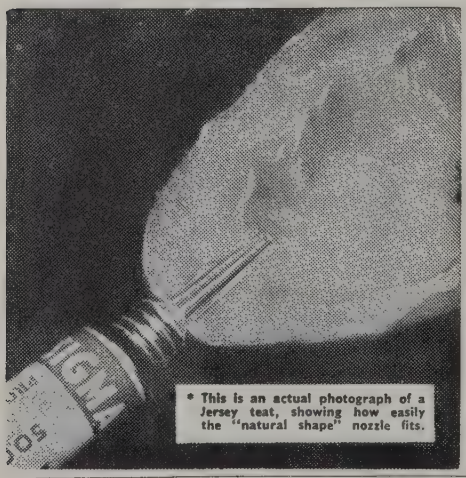

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REARING CALVES WITHOUT MILK

By
L. C. SNOOK, D.Sc.,
Animal Nutrition Officer

Fig. 1.—Twin heifer calves, Bramley Research Station. These were placed on reconstituted dried buttermilk as soon as they were obtained from the farmer.

IT is a tragic feature of Western Australian dairying that very few calves are reared by wholemilk producers. The explanation is a simple economic one. When milk is worth over 3s. per gallon, it is too valuable a product to feed to calves, particularly during the months when the dairy farmer is building up his summer quota. So, in the absence of a suitable substitute for milk, the calves are killed at birth.

This loss of heifer calves is particularly serious when one remembers that the wholemilk producer has better-than-average cows. The heifer calves from these cows are urgently needed to improve the productivity of our herds and it is the object of this talk to impress on the wholemilk producer that by using dried buttermilk powder, calves can be reared cheaply and easily on a minimum of milk. In fact, commercial dairyman are now showing that healthy, robust calves can be reared with no milk other than colostrum.

When several years ago, I began my trials with buttermilk powder I kept to recommended practice. For the first fortnight the test calves were fed on wholemilk and then, in textbook manner,

Fig. 2.—Test calves, Animal Health and Nutrition Laboratory. These calves were "borrowed" from a dairy farmer for the original tests carried out to determine the value of reconstituted dried buttermilk. As can be seen, the calves were scouring severely when obtained but after a few days on buttermilk the evil-smelling scouring had ceased and the calves were gaining weight.

gradually transferred to dried buttermilk mixed with water. Later I became more venturesome. Calves which at one week of age were brought home in the boot of my car, were at once put on to the buttermilk mixture. Despite this sudden change of diet, the calves did not scour or receive any setback. On this evidence I published recommendations to the effect that calves could be reared on 10 gallons of whole-milk plus buttermilk powder.

But practical dairymen have gone further. A number commence feeding their calves on buttermilk as soon as the cow's milk is fit to sell. I thought this was asking a bit too much of the innovation and, to test it out, brought home a two-day-old bull calf which my son reared on buttermilk in a suburban backyard. Further evidence was obtained at the Bramley Research Station last winter, where the calves received no milk other than the colostrum. These calves are now well grown and a picture of good health. They demonstrate very effectively that milk can be replaced at a very early age by buttermilk powder mixed in water. The cost of the purchased buttermilk worked out at about £5 per head. In addition to this the calves received good quality meadow hay and were rotated in three calf paddocks growing young green pasture.

Dried buttermilk is produced locally and costs 92s. per 100 lb. bag or about 11d. per pound. One and a quarter pounds of this powder is mixed with water for use in the same way as whole milk. The powder does not dissolve readily and it settles out quickly. For this reason it is preferable to put the quota for each calf in a separate bucket and add the water just before feeding. Calves take to the buttermilk solution without any difficulty, in fact a number of dairymen have told me that they have been surprised how easy it is to get young calves to take to bucket feeding when buttermilk solutions have been used.

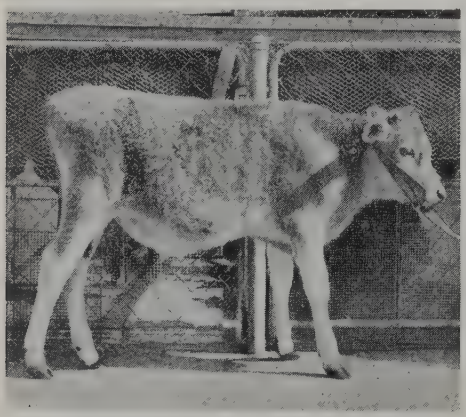


Fig. 3.—Jersey twin, Animal Health and Nutrition Laboratory. One of the calves used in the tests made to determine if buttermilk alone was adequate.

As is always the case when feeding calves, cleanliness is absolutely essential and only freshly prepared solutions should be fed. Do not overfeed. As before-mentioned, one and a quarter pounds of the powder is mixed with one gallon of water, the mixture being used in the same way as normally one would use milk. There will be a big demand for dried buttermilk. If it cannot be obtained use dried skim milk powder which costs about 1s. 2d. per pound in bulk lots.

Clean drinking water should always be available to calves. As soon as an appreciable volume of water is being consumed, buttermilk powder can be placed in sheltered feeding boxes for the calves to help themselves. There is no need to mix anything with this dried buttermilk. The calves like it and as soon as a reasonable quantity is being consumed, liquid feeding can be discontinued. Most dairymen seem to prefer liquid feeding but there are advantages in encouraging dry feeding as early as possible.

It is important to emphasise that calves should receive a daily issue of good quality hay and where possible, should be rotated on young pasture. On coastal properties, calves will also need a cobalt supplement, otherwise they will become unthrifty despite good food and attention.

Where there is plenty of skim milk there is no need to use dried buttermilk. Obviously this talk has been prepared for farmers who sell all their milk. I trust that the information does result in the survival of potentially valuable heifers which otherwise would be destroyed at birth.

(From a broadcast script made available by courtesy of the Australian Broadcasting Commission.)

SELF HELP IN SOIL CONSERVATION

(CONTRIBUTED BY THE SOIL CONSERVATION SERVICE)

LAND is regarded by many people as the symbol of permanence—as a solid asset to pass on to succeeding generations. But farmers know, or should know, that soil is not static. They know that erosion by water and wind can cause good soils to become wastelands, and that wise land use can change initially poor soils into fertile expanses.

Progressive countries encourage soil conservation and provide technical advice and assistance to farmers with problems in soil conservation and soil erosion. But all problems cannot wait for on-the-spot inspections and advice by specialists. Farmers can, and should, do everything possible to help themselves. Not every farmer has the ability or initiative, or the plant and equipment to tackle all his soil conservation problems, but much can be done in many cases as the following examples will show.

SELF HELP ON AN AVON VALLEY FARM

Mr. R. J. Wallace came to Western Australia about four years ago from Temora, New South Wales. He purchased a 960-acre property, the boundaries of which extend right to the Northam townsite. As he phrased it. "Its one of the few farms where the baker calls every day."

Like many Avon Valley properties it showed ample evidence of soil erosion after nearly a century of cereal and hay production and stock raising. Mr. Wallace recognised his problem and in July, 1953, attended a one-day Soil Conservation School for farmers, conducted by the Soil Conservation Service about 10 miles away in collaboration with the Irishtown Soil Conservation and Pasture Improvement Group.

At this school Mr. Wallace, with other farmers, learned more about the principles of soil conservation—the importance of improved pastures and crop management;

Fig. 1.—On Mr. R. J. Wallace's property at Northam, even these rocky ridges are carrying pasture. Superphosphate and pasture seeds are blown into the rough country by an air-blast topdresser

the soil erosion dangers of bare fallow; the value of contour banks and pasture furrows to help check down-hill flow of water. He saw examples of banks and bank construction with ploughs and small farm bulldozers. He learned how to lay out contour lines with a surveyor's level and with a simple and effective hose level devised by Soil Conservation officers.

Mr. Wallace requested a follow up visit to his farm by a Soil Conservation Adviser. When the visit was made several months later it was found that Mr. Wallace had already surveyed 300 acres for contour banks with his own hose level. His aim is to have as much rain as possible absorbed where it falls. "Rain is too scarce to waste," says Mr. Wallace, "and it does too much damage when it is allowed to run away."

The Wallace property is hilly with granite and other outcrops. Of its 960 acres only 630 acres are arable. Considerable gullying had occurred in the past and a very heavy rain in May, 1953, emphasised the need for prompt remedial measures.

The first visit of a Soil Conservation Adviser helped Mr. Wallace with suggestions for water disposal from contour bank system and with ideas for contour absorption banks and contour pasture furrows among the broken higher country. Contour banks have been built with a Fordson Major and a disc plough.

To improve stock-carrying capacity Mr. Wallace realised that pastures had to be improved on non-arable as well as arable land. Already his programme is paying dividends. Most of his arable land is carrying subterranean clover for a ley-farming programme and in addition, he has shown considerable ingenuity in adding to the sheep-carrying capacity of the non-arable areas.

To the power-lift scarifier with which he has equipped his tractor, he has added a grain and fertiliser box taken from a Sunderseeder. This is operated from a ground-wheel used also for depth adjustment.

The outfit is compact and highly manoeuvrable and with it he has sown oats, with superphosphate and subterranean clover over a large precentage of his broken country. Being attached directly to the tractor by the power-lift, the outfit can be raised and backed into awkward corners among rocks and trees to enable seed and super to reach every patch of cultivable ground. A small seed attachment facilitates the sowing of the

Fig. 2.—The air-blast topdresser mounted on the power lift system of the tractor

clover seed, and as a result of this work, his sheep have excellent feed growing on ground which normally carried only a sparse growth of native grasses. Even in these broken areas Mr. Wallace has laid out contour guide lines.

Over much of his non-arable land, even this outfit could not operate successfully because of the stony nature of the ground. This rough country was not left unimproved however. Another attachment for his Fordson Major is an air-blast top dresser equipped with its own engine. Mounted on a platform on the three-point suspension power-lift, this "Aero" top-dresser will blow superphosphate and subterranean clover seed into country where no implements could operate.

By taking advantage of suitable winds, superphosphate and pasture seeds have been blown into hill-top areas strewn with rocky outcrops so that excellent grazing is available on every part of the property.

Fig. 3.—A tractor-mounted scarifier fitted with a seed and fertiliser box from a Sundercut is used to sow oats, sub-clover and superphosphate in small patches of soil between rocks and trees

AN OLD-ESTABLISHED PROPERTY

Not many miles away, at Irishtown, on the other side of Northam, W. H. Morgan & Sons have carried out extensive contour

Fig. 4.—Oats and clover sown in broken country on Mr. R. J. Wallace's property

POISON Plants OF WESTERN AUSTRALIA

C. A. GARDNER,
(Government Botanist) and H. W. BENNETTS, D.V.Sc. *(Principal, Animal Health and Nutrition Laboratories)*

CABBAGE POISON

(Velleia discophora F. Muell.)

CABBAGE poison is a plant of bitter and disagreeable taste, not readily eaten by stock, but field evidence suggests that on occasions it may be responsible for mortalities, particularly of sheep. It was first tested and found to be toxic in 1939, with material obtained from the Koorda-Mollerin district.

The plant has a strong deep taproot, from the stock of which arise a number of erect or spreading, characteristically blue-green leaves like those of a wilted cabbage. Usually they are serrated on the margin like those in the illustration accompanying this article, but in some forms, notably when occurring in depressions, the leaves may be larger and deeply lobed like those of the wild radish, and more green than blue. The midrib of the leaf is strong and usually pink or purplish in colour. The average leaf is about 5 to 8in in length. These radical or basal leaves are the only leaves found on the plant.

From within this leaf rosette, one or more stout or wiry purplish flowering stems arise which may reach a height of 3ft., but are usually shorter. They are provided at intervals with a number of modified leaves or bracts which are round in outline, shallowly cup-shaped, and usually one to 2in. in diameter. At times (especially in the morning) these cups have an erect margin, and may contain water, following heavy dew or rain; at other times (especially in the afternoon) the cup is deflexed. This character is illustrated in the accompanying plate. Branching of the flower stems always takes place within these cups.

The flowers are arranged in a loose panicle, each branch of the inflorescence being subtended by a cup. The margin of the cup is smooth (entire) or may be lobed or toothed. The flower is typical of many of the Leschenaultia family (*Goodeniaceae*), to which cabbage poison belongs. The sepals are united into a deeply five-lobed cup, and the corolla is also deeply five-lobed, two lobes forming an upper lip, the other three a lower lip. Each corolla lobe is broadly winged by a delicate pale yellow limb. The flowers are succeeded by egg-shaped, brown capsules opening by two valves, and containing a few brown, yellow-winged round seeds.

The name *Velleia,* given by Robert Brown in honour of Thomas Velley, a British botanist who made a special study of seaweeds, was first published in 1810. The name *discophora* (disc-bearing) was given by Mueller, in reference to the cup-shaped bracts, which in pressed specimens sometimes appear flat and round.

Cabbage poison is restricted in its occurrence to Western Australia. It inhabits yellow sandy soil, with or without gravel, but sometimes also occurs in soils which are predominently gravelly. It favours open spaces, and is not found growing among dense scrub. Although it possesses a strong tap-root and is thus

a perennial, it does not appear to live for more than a few years, after which it disappears, only to reappear after the country is burnt, or after clearing and cultivation.

It is typically a plant of the Eastern Goldfields, being common on the open sandplains between Burracoppin and Coolgardie, and northwards to Lake Moore and Mount Jackson. It also extends to the south around Higginsville and Norseman, thence to Lake Hope and Salmon Gums, but in the south it is a smaller plant with smaller leaves. Its eastern limits are near Victoria Springs. The plant is also found in the eastern portions of the wheat belt. its western limits, as far as we know being Wubin, Marchagee, Dalwallinu and Wongan Hills. Koorda, Yorkrakine, Wyola, Bruce Rock, and thence to Salmon Gums.

The plant may easily be recognised by its peculiar blue-green almost fleshy foliage, and its cup-like bracts under each branch or group of branches along the elongated flowering stems.

TOXICITY

The poisonous properties of *V. discophora* were confirmed in a test carried out in Perth in 1939. An aqueous extract of finely minced flowers and leaves of the plant was administered by drenching to two sheep. One which received extract from 12oz. of plant showed signs of poisoning some four hours later and died within 18 hours; the other received a smaller dose equivalent to 3oz. of plant material and died within 24 hours.

SYMPTOMS

Both subjects showed extreme dullness and disinclination to move; when standing, the head was depressed. Respiration and heart rates were accelerated. The urine was dark and turbid. Finally the animals remained lying down and became comatose; the first died quietly without a struggle; the second, within half an hour of death showed a spasm of the muscles of the hind legs which were rigidly extended.

POST-MORTEM APPEARANCES

The sheep receiving the larger amount of extract showed gastro-enteritis but the stomach and intestines of the other subject were relatively normal. In both the kidneys were markedly congested and the heart showed haemorrhages (subendocardial.)

TOXIC PRINCIPLE

Bottomley and White (1953) isolated, from the plant, a new glucoside which they named vellein. This may be the principle responsible for poisoning.

PREVENTION OF EVAPORATION FROM WATER STORAGES

Australia's lower rainfall areas will benefit considerably if C.S.I.R.O's experiments on reducing evaporation from water storages prove successful.

Much of our pastoral land lies within the region in which evaporation is more than 72 in. a year—a figure greatly in excess of the rainfall.

In 1940 C.S.I.R.O. supported the late Dr. E. Heymann of the University of Melbourne in his attempts to use thick oil films to prevent water evaporation. His experiments proved successful in the laboratory but the method failed in the field, even on a small scale.

Early in 1953 the C.S.I.R.O. Division of Industrial Chemistry commenced work on films which are only one molecule thick. Although such films are less effective than thick oil films in preventing evaporation, they are much more stable. One chemical tested—cetyl alcohol—shows considerable promise. Under ideal laboratory conditions it reduces evaporation by 80 per cent.

Small-scale out-of-door tests using cetyl alcohol films have now been in progress in Victoria for about 18 months. The results show an average of 50 per cent. reduction in evaporation.

A larger-scale test was conducted last summer on a town reservoir at Woomerlang, Victoria. Two acres of water were treated and although the results were complicated by seepage it seems likely that evaporation was reduced by 30 per cent.

Further large-scale tests are to be made during the present summer. In Victoria 19 sites have been chosen ranging from one to 60 acres in area; in New South Wales six sites ranging up to 350 acres in area; and in Queensland seven sites all of about ½ acre. One site is already under test in Western Australia.

Until these tests have been completed it is not possible to make practical recommendations for using this technique. It seems that about 1 lb. of cetyl alcohol will be required per acre and that this treatment may last several years. Cost may be about 0.1 pence per 1000 gallons of water saved.

Cetyl alcohol now comes mostly from sperm oil from whales and total production is relatively small. However, synthetic material can readily be produced.

Fig. 1.—Portion of a vineyard in the Swan Valley after inundation. Fences and trellises were festooned with mud and debris

STORM DAMAGE IN VITICULTURAL AREAS

DURING the period February 14-17, very heavy rains fell over most of the State. The rainfall in the Avon Valley-Toodyay districts caused an extremely high flood level to be reached in the Swan River between Guildford and Upper Swan. It is doubtful whether the Swan River in these parts has ever before attained such a high level during the summer months. On the night of February 17, there was a rise in some places of as much as 19ft.

Rainfall recorded at Guildford during the period was as follows:—

	inches.
24 hours ending 9 a.m. February 15	70
24 hours ending 9 a.m. February 16	161
24 hours ending 9 a.m. February 17	211
24 hours ending 9 a.m. February 18	13
	455

Vineyards along the river flats and flood plains of the Swan Valley basin were inundated, and consequently suffered much damage. Many acres of vines were completely submerged for from three to seven days, causing severe damage to the vines, including loss of leaves which died beneath the water, and complete loss of fruit.

In some areas the current was so swift that trellises and fences were destroyed, vines were uprooted and much damage was done by heavy logs and tree trunks that were swept through by the water. Soil erosion on some properties was severe,

Fig. 2.—Large trees were carried by the swift current and deposited in vineyards on the river flats

many acres of surface soil being completely removed, but other vineyards gained a deposit of silt ranging from ½in. to 3in. in depth. There was some damage to machinery and loss of livestock.

In the viticultural areas ranging through Bindoon, Chittering, Upper Swan to Guildford, Toodyay, Northam and Bakers Hill, which were not inundated by flood waters but subjected to the torrential dowpours, there was also an appreciable loss of crop. The vines themselves did not suffer in these areas, but the rain fell in the middle of the currant harvest and fruit already on the racks became affected with mould. Fruit picked after the rain was affected with split berries and the quality of dried fruit will be reduced appreciably.

DISTRICT DAMAGE REVIEWED

1. The area embracing the flats and flood plains of the Swan River, where vineyards were completely inundated. There was almost a complete loss of crop and damage of a more or less serious nature to vines, trellises, and equipment. One vineyard on the plains of the Avon River at Northam was flooded and suffered severe damage. There was a total loss of crop on 247½ acres through inundation.

Fig. 3.—Bunches of currant grapes were left encased in mud and dried grass when the floods subsided

2. The districts in the Swan Valley between the river and the Darling Range were subjected to continuous heavy rain, but were not actually flooded. In this area, the greater proportion of grapes had been picked before the weather broke, and although there has been damage to the currants on the racks and also to those picked after the storm, most of the crop was still suitable for delivery to the packing sheds. A proportion of the fruit was mouldy and almost all has been reduced in grade. It was generally agreed that the damage incurred could have been caused in any season by rain of much less extent falling about the same time. This remark also refers to table grapes, export grapes, and wine grapes in this area. Most of the export grapes (Canon Halls) had been picked before the storm.

Some varieties of wine grapes were completely ruined through splitting of berries, whereas other varieties suffered no damage and in fact had even benefited.

Throughout this area, as throughout the whole of the vine-growing districts, the sultana crop, the harvest of which had not commenced prior to the storm, was completely ruined through splitting and mould.

3. Mooliabeenie, Bindoon, Chittering, Muchea, Toodyay, Northam, Bakers Hill. Although vines in these districts were not inundated, the excessive rainfall on the heavy class of soil caused more damage than in other districts. The percentage of split berries was greater. The fruit in these areas is later maturing than the Swan Valley, and less currants had been picked prior to the storm. There was also a greater incidence of mould in currants drying on the racks.

Sultanas have been almost completely spoilt on the vines. Inexperience on the part of growers was the cause of excessive mould damage to currants on the racks in this area. Very few had sprayed with sodium bisulphite or potassium metabisulphite as a mould prevention, as recommended by a Departmental press paragraph issued at the time, while many growers had left the protective screens on the sides of the racks even after the fine weather returned.

Fig. 4.—A typical scene of desolation on a flood-swept property. Topsoil to a depth of several inches has been swept away, fences are down and vines and trellises coated with mud and rubbish. Vines in the foreground have been uprooted

Fig. 5.—A tangle of mud-encrusted wire, posts and vines following upon the flooding of the river flats

HOW THE GRAPES WERE AFFECTED

Damage incurred by the various types of grapes is as follows:—

1. Currants.

(i) Splitting of currants on the vines and loss of juice and sugar.
(ii) Mould damage on the vines.
(iii) Mould damage on the racks.

In all vineyards where currants were split by the rain, mould damage occurred, but in some vineyards mould was serious on almost the entire crop. This occurred particularly where currants were on low trellises and the vines were heavy with foliage.

Mould damage on the racks occurred where fruit was picked after the rain or immediately prior to the rain, and was aggravated on properties where racks and trays had been heavily filled with fruit or where ventilation was inadequate. The use of sodium bisulphite or potassium metabisulphite sprays when used by growers reduced the incidence of mould considerably.

2. Sultanas.

Throughout all areas, the sultanas split very badly, and none of the fruit remained fit for dipping. Where sultanas had been dipped, most will only be fit for distillation. Some growers with fruit giving a high beaumé reading and without much mould, were fortunate to have their fruit accepted by the wineries. The damage to sultanas is general in all districts, but the quantity grown is not great.

3. Table and Export Varieties.

Most of the Canon Hall Muscats and some of the Red Prince and Flame Tokay varieties were picked before the rain. The risk of breakdown has prevented vignerons from packing Red Prince and Flame Tokay for export. Where packing has been continued, the trimming of bunches to remove split and damaged berries has increased the labour required in preparing the fruit for market.

Muscat Gordo was little affected by the rain, although it has been noticed in many cases that the variety has become soft and flabby soon after reaching maturity.

The valuable export varieties Red Emperor and Ohanez have improved since the rain, and an increase in yield can be expected.

The varieties Wortley Hall, Santa Paula and Waltham Cross were affected by the rain, but the extent of the damage varied from place to place.

In general, apart from properties that were inundated, the damage to table and export varieties of grapes was not severe, although there has been some reduction in quality in certain districts and an increase in the cost of cleaning and packing the fruit.

4. Wine Grapes.

The varieties Pedro and Semillon split badly, and much mould damage and shedding of berries occurred. These varieties which suffered most amongst the wine grapes, comprise only a small proportion (roughly 10 per cent.) of the area under wine varieties. There was less splitting in Grenache and Burgundy, and consequently less mould. In some vineyards, the quality of Grenache has improved.

FOOTROT CONTROL.

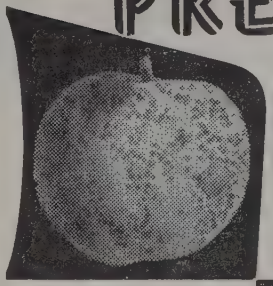
ON several occasions recently sheep from properties in quarantine for footrot have been forwarded for sale without reference to the Department.

The removal of sheep from a property in quarantine and their subsequent sale by auction to other graziers whose flocks are free of the disease is a serious offence for which a heavy penalty has been prescribed under the Stock Diseases Act regulations, and flock owners are warned that it will become necessary to take legal proceedings should this practice be continued.

When any property is found to be affected by footrot, quarantine restrictions are imposed as a precaution against the further spread of the disease to other properties and this quarantine is maintained until the flock has been freed of infection.

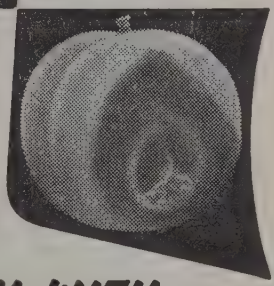
Permits for the sale of sheep for the purpose of immediate slaughter at Midland Junction from properties affected by footrot may be obtained upon application to the Department either direct or through any of the livestock agents.

PREVENT



LATE SPOT OF APPLES

AND BROWN ROT OF PEACHES



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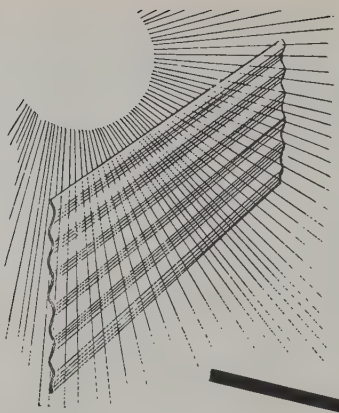

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BACTERIAL CULTURES

Department of Agriculture Service Discontinued

By W. P. CASS SMITH, Government Plant Pathologist

IT was announced recently by both press and radio that the Department of Agriculture, which for nearly 30 years, has been supplying farmers with bacterial cultures for leguminous seed inoculation, has discontinued this service. This decision was made because adequate supplies of commercial peat cultures are now available through ordinary commercial channels.

Although this talk is concerned mainly with commercial cultures and their use, a brief review of the Department's activities in connection with leguminous seed inoculation may not be out of place, for this work was largely pioneered in Australia by agricultural scientists in this State.

In 1926 it was found the failure of many lucerne crops was caused by lack of the beneficial root-nodule-forming bacteria in the soil. To overcome this difficulty the bacteria were grown in culture bottles on an "agar" medium and issued to farmers, who mixed the contents with skim-milk and inoculated the lucerne seeds before planting.

The results were so satisfactorily that the demand for cultures soon increased and other bacterial strains for the inoculation of peas, clovers, lupins, barrel medic etc., etc., were obtained. Some new strains were isolated from plants grown locally—others were secured from abroad.

All told about 100,000 standard agar cultures have been prepared and distributed by the Department of Agriculture to farmers in Western Australia and this service has proved of inestimable value to the State for in many instances inoculation has meant the difference between success and failure in the establishment of important leguminous crops.

Leguminous seed inoculation is now so common that commercial firms have entered the field. Unlike the standard agar cultures, the commercial cultures are prepared in powder form and contain finely-ground peat as a carrier for the bacteria.

These peat cultures were tested last season by the Department of Agriculture and it was found that, provided they contain effective strains of bacteria, they are as satisfactory as standard agar cultures. For this reason arrangements have been made to include strains recommended by the Department of Agriculture in commercial cultures marketed in W.A.

Because the peat cultures are sold in powder form they are sometimes referred to as dry-cultures. However, this term is incorrect for the peat contains a standard amount of moisture which helps to keep the bacteria alive. The moisture is retained by packing the cultures in sealed plastic containers which should be stored in a cool place and not opened until the seed is inoculated. When using the peat cultures there are a few important points to be noted although in general the same precautions and sowing practices long recommended by the Department for successful inoculation with agar cultures—should be observed with commercial peat cultures. These precautions include:—thorough mixing of the culture with the seed, planting the inoculated seed as soon as possible in moist soil, and avoidance of contact with acid fertilisers such as superphosphate. If, as sometimes happens, mixing of inoculated seed and super cannot be avoided, the mixture should be sown within half an hour. Alternatively, basic superphosphate may be used.

It has been noticed, however, that some leaflets issued with commercial cultures recommend the use of 50-50 lime-super mixture. This recommendation should be treated with caution under W.A. condi-

tions, for in some cases 50-50 lime-super mixture has had a deleterious effect on growth. Lime should only be applied on the basis of local knowledge and as recommended by the local agricultural adviser.

Finally, a few words concerning the ordering of commercial cultures. Farmers should place their orders directly with the distributors rather than with this Department and state the **type** and **quantity** of seed to be inoculated. At the present time the distributors include most of the leading stock firms, seedsmen or agents.

(From a broadcast talk given over Station 6WF.)

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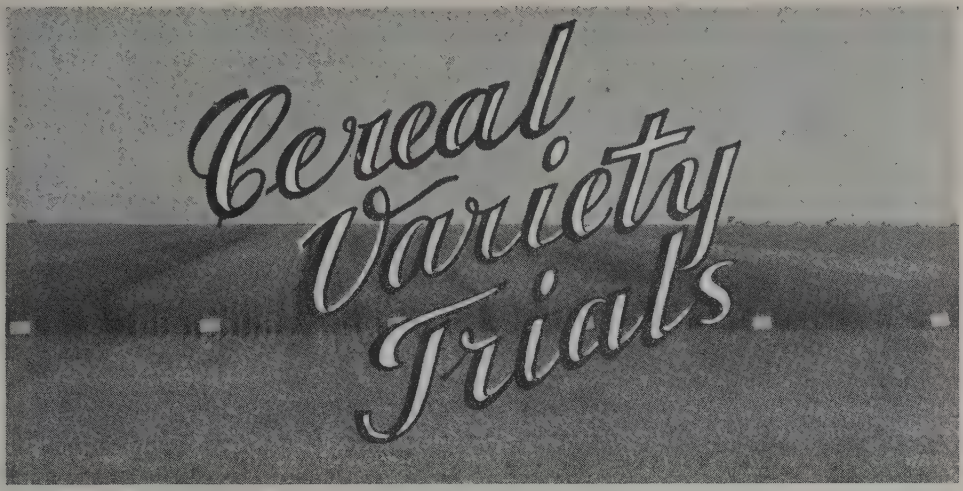


RESULTS FOR 1954/55 SEASON

By F. L. SHIER, B.Sc. (Agric.), Superintendent of Wheat Farming, and
J. REEVES, B.Sc. (Agric.), Plant Geneticist

CEREAL variety trials are carried out each season to determine the relative yielding ability of varieties produced in this State or introduced from other States. After harvest, grain samples from each wheat trial are forwarded to the Cereal Research Laboratory for flour quality tests.

The rainfall figures for the research stations on which trials were conducted are summarised in the following table:—

TABLE 1

Rainfall at Research Stations, 1954-55 Season

Station.	Mar.	Apr.	Growing Period.							Annual Total.
			May.	June.	July.	Aug.	Sept.	Oct.	Total.	
Avondale, 1954	0	46	207	135	325	192	123	3	985	1,069
Average, 28 years	82	84	216	322	297	218	103	78	1,235	1,549
Chapman, 1954	0	73	179	134	307	233	70	67	990	1,153
Average, 49 years	63	77	232	409	386	256	141	88	1,511	1,776
Merredin, 1954	0	28	289	54	237	158	68	53	859	922
Average, 44 years	89	85	141	184	183	148	78	72	807	1,170
Salmon Gums, 1954	1	46	91	55	80	157	97	41	521	636
Average, 29 years	124	86	128	148	141	143	102	111	773	1,316
Wongan Hills, 1954	0	38	202	125	244	130	75	13	789	873
Average, 29 years	88	94	189	257	259	193	89	68	1,054	1,388

The season commenced somewhat later than usual with good opening rains towards the end of May. Below average falls in June provided good seeding conditions, with very little interruption from rain. However, this dry period, particularly at Merredin slowed growth of newly germinated crops.

Timely falls in July and August enabled crops and pastures to grow well, with prospects of a good season. However, in October, rains were below average and most crops had insufficient moisture for full grain formation. In consequence, yields although average, were below those of recent seasons.

RESULTS, WHEAT VARIETY TRIALS

The results for the 1954 wheat variety trials are given in Table 2, together with average percentage yields covering the years the various varieties have been under trial. Due to adverse seasonal conditions, no results were obtained from Salmon Gums, but averages for each variety under test at this Station, have been included in this table for reference purposes.

In Table 3 the more important characteristics of the varieties have been briefly detailed including disease resistance, flour quality and maturity.

Midseason Varieties (for early planting).

With a few exceptions, varieties on all Stations gave similar percentage yields as in previous seasons. At Chapman, both Bencubbin 48 and Kondut were outyielded by Bencubbin. This is normal for Bencubbin 48 but unusual for Kondut which generally yields about the same as the control variety.

Javelin 48 did not yield as well as in the previous season, except at Wongan Hills where it gave slightly more than any other variety. The premium variety Festival has given low yields for each season it has been under trial and has therefore been discarded. The other new variety,

TABLE 2

Wheat Variety Trials at Research Stations, 1954-55 Season

Variety.	Avondale.			Chapman.			Merredin.			Salmon Gums.			Wongan Hills.		
	Yield Bus./ Acre.	Percentage of Control.		Yield Bus./ Acre.	Percentage. of Control.		Yield Bus./ Acre.	Percentage. of Control.		Yield Bus./ Acre.	Percentage. of Control.		Yield Bus./ Acre.	Percentage. of Control.	
		1954.	Aver-age.		1954.	Aver-age.		1954.	Aver-age.		1954.	Aver-age.		1954.	Aver-age.
MIDSEASON MATURING VARIETIES.															
Bencubbin	24·1	100	100	12·2	100	100	13·9	100	100	....	....	100	7·8	100	100
Bencubbin 48 ...	22·5	93	(4) 95	10·4	86	(4) 88	13·5	98	(4) 88	....	....	(3) 96	7·8	100	(3) 99
Javelin 48	23·2	96	(3) 105	11·2	92	(3) 94	12·9	93	(3) 101	....	....	(2) 94	8·0	102	(2) 90
Kondut	25·9	107	(11) 106	10·9	89	(11) 100	....	....	....	....	....	....	7·3	93	(9) 94
Eureka	26·2	109	(11) 109	11·9	98	(11) 101	....	....	....	....	....	(10) 90	7·8	100	(9) 96
Festival	23·3	97	(2) 102	11·4	93	(2) 93	....	....	....	....	....	....	7·5	96	....
Sabre	23·3	97	....	11·5	94	....	12·8	92	....	....	....	....	7·4	94	....
Diff. for sig. P = ·05	2·3	9	....	0·9	7	....	0·6	4	....	....	....	....	Not Sig.		
EARLY-MIDSEASON MATURING VARIETIES.															
Bencubbin	....	....	....	15·3	100	100	16·3	100	100	....	....	100	10·0	100	100
Eureka	....	....	....	15·3	100	(3) 95	13·6	83	(3) 82	....	....	98	9·6	96	(3) 98
Gabo	....	....	....	18·9	124	....	17·0	104	....	....	....	....	12·2	122	....
M. 109	....	....	....	14·7	96	(3) 95	12·9	79	(3) 92	....	....	103	8·8	88	(3) 93
M. 114	....	....	....	13·0	85	....	13·5	83	(2) 97	....	....	....	10·3	103	(2) 103
Diff. for sig. P = ·05	....	....	....	1·0	6	....	1·1	7	....	....	....	....	1·0	10	....
EARLY MATURING VARIETIES.															
Bungulla	22·5	100	100	16·8	100	100	17·6	100	100	....	....	100	13·9	100	100
Wongoondy	22·7	101	(8) 109	18·0	107	(7) 98	15·9	90	(9) 98	....	....	(8) 105	14·6	106	(8) 95
Gabo	22·1	98	(8) 111	17·4	103	(7) 100	17·5	100	(9) 96	....	....	(7) 100	15·0	108	(8) 102
Insignia 49	22·3	99	(3) 102	15·3	91	(3) 112	16·8	96	(4) 103	....	....	(3) 118	14·7	106	(4) 105
Saga	....	....	....	....	....	....	15·5	88	....	....	....	....	12·1	87	....
M. 115	20·1	89	....	15·9	94	....	14·0	79	(2) 76	....	....	....	12·1	87	(2) 100
M. 116	....	....	....	....	....	....	15·9	90	....	....	....	....	....	....	....
M. 117	....	....	....	....	....	....	16·4	93	....	....	....	....	14·3	103	....
M. 118	....	....	....	....	....	....	17·7	100	....	....	....	....	14·8	107	....
Diff. for sig. P = ·05	1·6	7	....	1·2	7	....	1·4	8	....	....	....	....	0·9	6	....

N.B.—The figures in brackets indicate the number of years under trial.

Fig. 1.—Wheat cross-breds being tested for rust-resistance in the "rust garden" at the Wongan Hills Research Station. Sprinklers are used to make conditions ideal for rust infection in the enclosure.

TABLE 3

Characteristics of Varieties Under Trial

Variety.	Produced by.	Maturity.	Stem Rust Resistance.	Flag Smut Resistance.	Grain Quality.
Bungulla	W.A. Dept. of Agric.	Very Early	Susceptible	Resistant	F.A.Q.
Bencubbin	do. do.	Midseason	do.	do.	do.
Kondut	do. do.	Late Midseason	do.	do.	Medium strong
Wongoondy	do. do.	Early	do.	do.	Nearly strong
Eureka	N.S.W. Dept. of Agric.	Midseason	do.	Highly resistant	do. do.
Festival....	do. do.	Early Midseason	Resistant	do. do.	Strong
Gabo	Sydney University	Early	do.	Susceptible	Nearly strong
Saga	do. do.	do.	do.	Resistant	do. do.
Insignia 49	Waite Institute	do.	do.	Moderately susceptible	F.A.Q.
Javelin 48	do. do.	Midseason	do.	Resistant	Medium strong
Bencubbin 48	do. do.	do.	do.	do.	F.A.Q.
Sabre	Roseworthy College	do.	do.	do.	Medium strong
M. 109	W.A. Dept. of Agric.	Early midseason	do.	do.	do. do.
M. 114	do. do.	do. do.	do.	Highly resistant	do. do.
M. 115	do. do.	Early	do.	do. do.	Nearly strong
M. 116	do. do.	do.	do.	Resistant	do. do.
M. 117	do. do.	do.	do.	Highly resistant	Above F.A.Q.
M. 118	do. do.	do.	do.	do. do.	do. do.

Sabre from Roseworthy College, also gave rather disappointing results. The latter was developed from a complex cross using Gabo as one parent.

On the higher rainfall stations, particularly at Avondale, Eureka and Kondut continue to give satisfactory yields. As they both possess strong straw, these two varieties are particularly suitable for sowing on clover ley pastures. They show that high yields and flour quality can be obtained at the same time, as they are both superior in flour quality to Bencubbin. The sowing of these and other high quality varieties such as Gabo and Wongoondy will do much to raise the standard of the wheat grown in this State.

Early Varieties (for late planting).

Because of insufficient seed, Saga was planted only at Merredin and Wongan Hills. On both stations yields were low. It was bred at Sydney University from a double cross involving Gabo, Pusa IV and an unknown variety and will be retested in future trials.

Gabo yielded approximately the same as Wongoondy, except at Merredin where the latter yielded 10 per cent. less. However, over a nine year period, average yields on this Station are the same. Both varieties can be recommended for late planting in all zones of the wheatbelt and because of their strong straw, they are particularly suitable for planting on "light land" in the medium and high rainfall areas. They are also recommended for their flour quality, both being greatly superior to Bungulla in this respect.

Insignia 49 was outyielded by Bungulla at Chapman, but outyielded the latter at Wongan Hills. On average it yields slightly more than this control variety on all stations. Unfortunately it is only of f.a.q. flour quality and does not appear to have the drought resistance of Bungulla.

The Merredin cross-bred M.115 was included in the trials for the second season. Yields on all stations were low and it has been discarded. Three new cross-breds, M.116, M.117 and M.118 were under test for the first time. They have been developed from the cross Charter x (Bungulla)^2. M.116, the strongest in flour quality, gave the lowest yields and has been discarded. Yields of the other two were satisfactory, particularly at Wongan Hills where M.118 outyielded Bungulla.

Early-midseason Varieties.

This was a continuation of a similar trial in the previous season. Gabo was the highest yielding variety due probably to the dry season, which favoured the early maturing ones. M.114 yielded better than M.109. The latter cross-bred has now been discarded. The recommended varieties for the three major zones of the wheatbelt are listed in Table 4.

TABLE 4

Recommended Wheat Varieties.

Maturity Group.	Zone 1 (Early). Less than 14 in. annual rainfall.	Zone 2 (Mid-season). 14 in. to 18 in. annual rainfall.	Zone 3 (Late). Above 18 in. annual rainfall.
Midseason and Late Midseason	Bencubbin Bencubbin 48	Kondut Eureka Bencubbin Bencubbin 48	Kondut Eureka Bencubbin Bencubbin 48
Early and Very Early	Bungulla Wongoondy Gabo	Gabo Wongoondy Bungulla	Gabo Wongoondy

Fig. 2.—A pure-line plot of Avon oats, a new variety bred at the Wongan Hills Research Station

RESULTS, OAT VARIETY TRIALS

Yields from the Oat Variety Trails are set out in Table 5.

Ballidu was included in the early planted trials at Chapman and Merredin. It yielded more than the midseason varieties, due to the relative dryness of the season.

Early Planted Trials (midseason and late varieties).

The cross-bred W.29 which yielded so well in the 1953 variety trials was named Avon and was released for general cultivation. Yields in 1954 were not as impressive as previously; however, they were equal to Dale at Avondale and Merredin and higher than Dale on the other two stations. It is apparent from results to date, that Avon is capable of giving high yields in the medium to high rainfall areas of the wheatbelt, but is unsuitable for the low rainfall areas.

Avon is a medium to short strawed midseason maturing variety with awnless grain, which is firmly held in the panicle. It was produced at Wongan Hills, from the cross Ballidu x M.59, the latter being derived from Mulga and Laggan. The second cross-bred in this trial, W.31 gave low yields. As it does not appear to be suitable for the wheatbelt, it has been discarded.

The yields for Algerian were considerably lower than normal, no doubt again due to the dryness of the season, which did not suit this late maturing variety. Algerian, however, is a useful variety for planting in areas receiving more than 18in. annual rainfall.

Late Planted Trials (early and very early varieties).

As perhaps could be expected from the seasonal conditions, the very early maturing variety Wongan, yielded exceptionally well at three stations, Avondale, Chapman and Wongan Hills. With its vigorous early winter growth, it is a variety suitable for both early grazing and grain production, particularly in the lower rainfall areas.

Orient and W.30 yielded well at Avondale and Chapman. On average, Orient consistently outyields Ballidu. W.30 (which is not quite as good a yielder as Orient) is a sister selection to Avon.

The recommended varieties for each of the three major zones are listed in Table 6.

TABLE 5

Oat Variety Trials at Research Stations, 1954-55 Season

Variety.	Avondale.			Chapman.			Merredin.			Wongan Hills.		
	Yield Bus./ Acre.	Percentage of control.		Yield Bus./ Acre.	Percentage of control.		Yield Bus./ Acre.	Percentage of control.		Yield Bus./ Acre.	Percentage of control.	
		1954.	Aver-age.		1954.	Aver-age.		1954.	Aver-age.		1954.	Aver-age.
Early Planted Trial.												
Dale	23·0	100	100	7·4	100	100	19·5	100	100	23·2	100	100
Ballidu	....	....	....	16·9	227	....	22·2	114	....	....	....	....
Avon (W. 29)	26·4	115	(2) 134	11·2	150	(2) 119	19·4	100	(2) 112	27·1	117	(2) 124
Algerian	17·8	77	(2) 84	....	....	....	....	....	....	18·6	80	(2) 85
W. 31	23·5	102	(2) 111	2·3	30	(2) 91	12·4	64	(2) 92	24·5	106	(2) 110
Diff. for sig. P = ·05	4·8	21	....	1·9	26	....	2·5	13	....	0·9	4	....
Late Planted Trial.												
Ballidu	31·1	100	....	18·6	100	100	24·7	100	100	29·6	100	100
Orient	33·0	106	....	20·9	112	(3) 123	21·8	88	(5) 108	27·8	94	(4) 105
W. 30	33·8	109	....	20·6	111	(3) 108	23·9	97	(3) 104	24·2	82	(2) 91
Wongan	43·2	139	....	24·6	132	(3) 102	25·6	104	(5) 86	34·2	115	(4) 87
Not Randomized	....	....	....	....	....	....	....	....	....	....	....	....

N.B.—The figures in brackets indicate the number of years under trial.

TABLE 6

Maturity Group.	Zone 1. Less than 14 in. annual rainfall.	Zone 2. 14 in. to 18 in. annual rainfall.	Zone 3. Over 18 in. annual rainfall.
Late	....	Algerian	Algerian
Midseason	Dale	Avon .... Dale	Avon Dale
Early	Ballidu Orient	Ballidu Orient	Ballidu Orient
Very Early	Wongan	Wongan	Wongan

RESULTS, BARLEY VARIETY TRIAL

The yields for the barley variety trial carried out at Avondale are as follows:—

TABLE 7

Variety.	Type.	Yield Bush. per Acre.	Percentage of Control. 1954.	Percentage of Control. Average.
Atlas	6-row	32·5	124	(11) 121
Beecher	6-row	32·0	122	(3) 138
Prior	2-row	26·2	100	100
Maltworthy	2-row	25·5	97	(11) 119
Lenta	2-row	21·0	80	....
Riegel	2-row	18·0	69	....
Freja	2-row	17·8	68	(3) 126
Ymer	2-row	15·1	58	..
Carlsberg	2-row	14·1	54	..
Diff. for Sig. P = ·05		2·9	11	....

The 6-row variety Beecher was reintroduced into the trial, the yield being almost the same as for Atlas. It is agronomically a more desirable variety than Atlas, as it has smooth awns and a white grain.

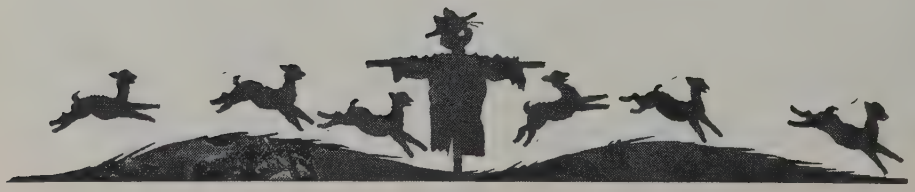
A number of recently introduced 2-row malting barleys were also included in the trial, but their yields were disappointing, due probably to a very dry October, when only three points of rain were registered during the month.

The recommended varieties and the purposes for which they should be grown, are set out in the following table:—

TABLE 8

Use.	Zone 1. Less than 14 in. annual rainfall.	Zone 2. 14 in. to 18 in. annual rainfall.	Zone 3. Over 18 in. annual rainfall.
For Malting—			
Local Trade	....	Prior, Maltworthy *	Prior, Maltworthy
Export Trade	....	Atlas	Atlas
For fodder, grazing, grain	Atlas	Atlas	Atlas

* Higher rainfall areas of this Zone.



LIBRARY SERVICE OF W.A.

BOOKS... *for FARMERS*

THE following books on agriculture have been added to the stock of the Library Board of Western Australia and can be borrowed freely from public libraries in the following districts:—York, Donnybrook, Moora, Wongan Hills, Quairading, Augusta-Margaret River, West Arthur, Drakesbrook.

GENERAL

THE FARMERS' HANDBOOK. New South Wales Department of Agriculture. 5th ed. Syd. 1944.

FARMERS' HANDBOOK. The Weekly Times. 5th ed. Melb., 1954.

NATURE IN FARMING, by J. W. Paterson. 5th ed. Perth, 1948.

QUESTION AND ANSWER BOOK. The Farmers Weekly. Lond., 1952.

THE SMALLHOLDER ENCYCLOPAEDIA, edited by S. A. Maycock and J. Hayhurst. Lond., 1950.

FARM MANAGEMENT

FARM MANAGEMENT ANALYSIS, by L. A. Bradford and G. L. Johnson. N.Y., 1953.

LOOK TO THE LAND, by Lord Northbourne. Lond., 1940.

SOIL AND CROP MANAGEMENT

FARMING AND GARDENING FOR HEALTH OR DISEASE, by Sir A. Howard. Lond. 1945.

PLANT BREEDING FOR EVERYONE, by J. Y. Beaty. Boston, 1954.

THE PROPAGATION OF PLANTS, by E. J. King. 2nd ed. Lond., 1952.

SIMPLE PROPAGATION, by N. J. Proctor, Lond., 1950.

SOIL, by G. V. Jacks. Lond., 1954.

SUPPRESSION OF WEEDS BY FERTILISERS AND CHEMICALS, by H. C. Long and W. E. Brenchley. 3rd ed. Lond., 1949.

PRODUCTION OF CROPS

THE CULTURE OF LUCERNE, by W. S. Hill. Auckland, 1925.

FRUIT GROWING

BETTER PRUNING OF FRUIT, by N. Stewart. Lond., 1955.

FRUIT. Commonwealth Economic Committee. Lond., 1953.

WESTERN FRUIT GARDENING, by R. M. Brooks and C. O. Hesse. Berkeley, Calif., 1953.

LIVESTOCK

BEEKEEPING, by K. K. Clark. Harmondsworth (Mddx.), 1951.

BEE-KEEPING UP TO DATE, by A. B. Flower. 6th ed. Lond., 1952.

BREEDING AND MANAGEMENT OF LIVESTOCK, by A. W. G. Lipscomb. 6th ed. Christchurch, 1954.

EGGS FOR MONEY, by W. Marlowe. Lond., 1954.

ELEMENTARY VETERINARY SCIENCE FOR AGRICULTURAL STUDENTS, FARMERS, AND STOCK KEEPERS, by H. Thompson. 5th ed. Lond., 1935.

MAKING MONEY FROM PIGS, by J. Luscombe. Ipswich (Suffolk), 1953.

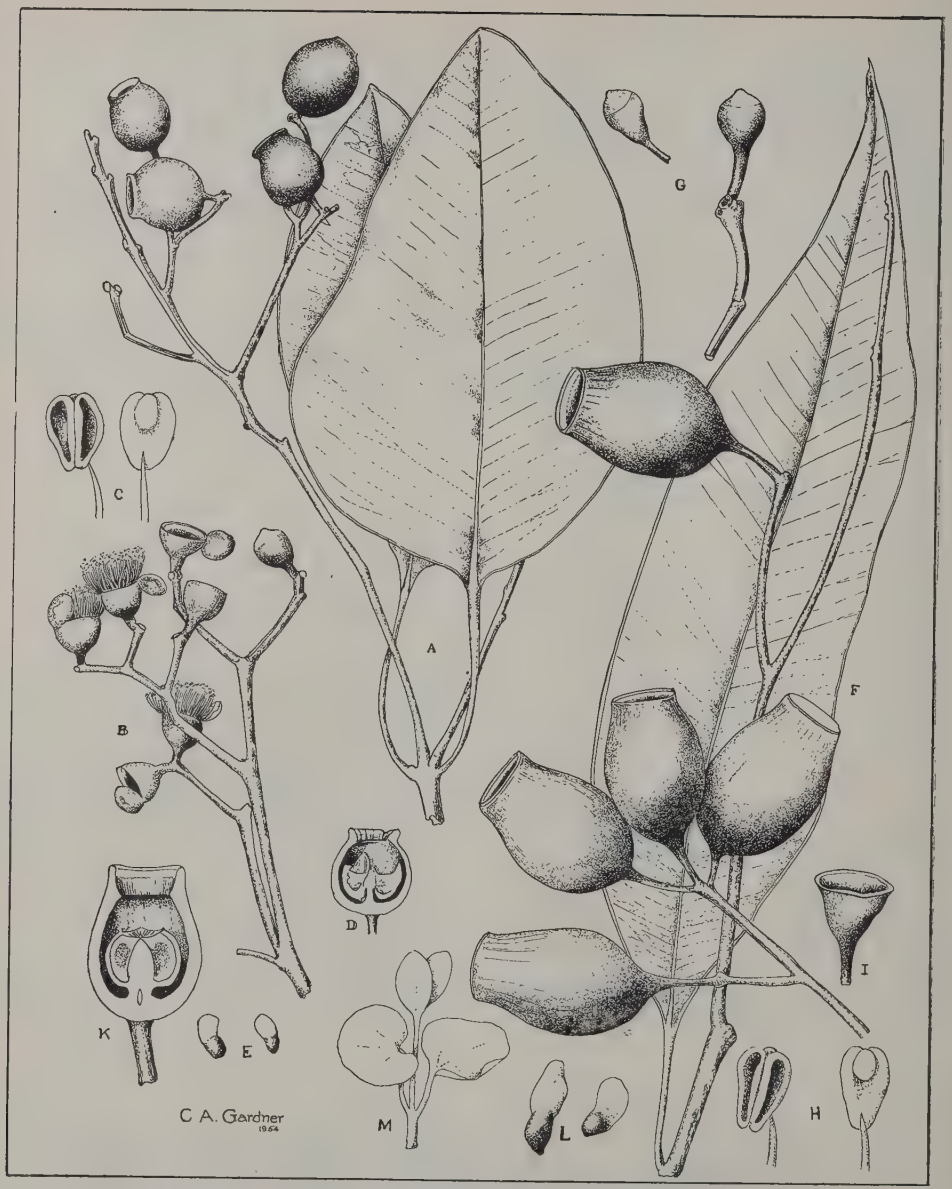
POULTRY FARMING. Victoria Department of Agriculture. 9th ed. Melb.

POULTRY HOUSES AND APPLIANCES. Rev. ed. Lond., 1953.

THE POULTRY KEEPER'S TEXT BOOK, by E. T. Brown. New ed. Lond., 1954.

THE SHEPHERD'S DOGS, by C. W. G. Hartley. Christchurch.

THE SIMPLIFIED VETERINARY GUIDE AND HOME REMEDIES, by W. C. Fair. Syd., 1939.



A to E inclusive—Eucalyptus latifolia F. Muell.

A—Branchlets with leaves and fruits; B—Portion of panicle showing flowers; C—Anthers; D—Section of fruits; E—Seeds. Upper Moran River near Mount Hann. Gardner 1448 June 30, 1921

Icon. origin.

F to M inclusive—Eucalyptus Foelscheana F. Muell.

F—Leaf and fruits; G—Flower buds; H—Anthers; I—Calyx after flowering; K—Section of fruit; L—Seeds; M—Cotyledons. Admiralty Gulf. Gardner 1486. July 24, 1921

Icon. origin.

TREES OF WESTERN AUSTRALIA

By C. A. GARDNER, Government Botanist

Nos. 31 to 34—Four Bloodwoods from the Kimberleys

THE four bloodwoods dealt with in this article are small trees restricted to the Kimberley Division of Western Australia and include Eucalyptus latifolia, F. Muell.; Eucalyptus Foelscheana, F. Muell.; Eucalyptus lamprocalyx, Blakely, and Eucalyptus Cliftoniana, W. F. Fitzg. They grow in sandy soils or in stony places among sandstone rocks, and seldom exceed 40ft. in height. E. lamprocalyx and E. Cliftoniana are little-known species concerning which further information is required.

The characteristics of bloodwood trees include a persistent, flaky or flaky-smooth bark. When rough, the bark is persistent; when flaky it is shed annually. Occasionally it may be almost as smooth as the bark of a gum-tree but usually has a small quantity of flaky bark present, generally at the base of the trunk.

Another characteristic is the leaf, which has a system of close parallel nerves diverging from the midrib at a wide angle, sometimes almost at a right-angle.

The third characteristic is found in the flowers and fruits which are arranged in large branched trusses, not in simple umbels; the operculum, or bud-cap, is short sometimes almost like a disc and tardily falling away from the calyx as the filaments of the flower expand.

The fruits are globular or urn-shaped, i.e., the fruit has a "neck" or constriction below the opening. They are somewhat hard and woody, and the fertile seeds are large, few in number and usually winged.

No. 31—THE ROUND-LEAVED BLOODWOOD

(*Eucalyptus latifolia* F. Muell.)

This tree inhabits the sandstone valleys and basaltic undulating country between the Moran, King Edward and Carson rivers in North Kimberley. It is most frequently found on the light, sandy soils, with the Woollybutt (*E. miniata* A. Cunn, ex Schau). Both the popular and specific names refer to the shape of the leaves (*latifolius*—broad-leaved).

The species is a tree 25 to 50ft. tall with a trunk up to 25ft. in height and up to 20in. in diameter. The branches are spreading or drooping and the timber is pink, dense and rather hard.

The bark is yellowish-pink in colour, rarely white, and spotted with small purple grey-flakes of tardily-shedding bark giving the trunk a mottled appearance.

The leaves are broad and somewhat obtuse, pale green or glaucous, on long stalks, and with the blade usually 3 to 4in. in length.

The flowers are arranged in large terminal panicles, are white in colour, and the obtuse operculum (bud-cap) often remains hinged to the calyx when the flowers expand.

The ovoid-globular fruit is woody, about half an inch in length, and pale green with brown spots when ripe. The rim is rather thick and the valves enclosed.

No. 32—*Eucalyptus Foelscheana* F. Muell.

This smooth-barked bloodwood was named after Paul Foelsch of Darwin who collected the first specimens of the tree. It differs from *E. latifolia* in its smaller size, much narrower green leaves, and the larger size of its fruits.

The tree is common on the basalt (andesite) country of North Kimberley around Admiralty Gulf, and the lower

King Edward and Carson rivers. It rarely exceeds 35 ft. in height and is usually of lesser stature. The timber is red in colour, hard and dense.

The bark of the tree is white or pale buff in colour. It may be quite smooth, but sometimes carries patches of purplish, somewhat persistent bark, giving the trunk a mottled appearance.

The leaves, usually light green in colour, are lustrous, narrow and vary from 4 to 7in. in length. As far as observed, they are pendulous. The sucker-leaves are remarkably large, sometimes as much as 15in. in length and 11in. in width.

I have not seen the flowers, but the fruits are vase-shaped mostly about 1¼in. long with faint longitudinal striations. The capsule is deeply included, and the relatively large seeds are winged.

No. 33—*Eucalyptus lamprocalyx* W. F. Blakely.

This is one of the lesser-known *Eucalyptus* species and has been included in the series in the hope that the information contained in the following notes and the accompanying plate, may be sufficient to enable interested persons to recognise and rediscover this tree. It has not been seen since its discovery 50 years ago, although I have searched for it in many places from Native Well to Kimberley Downs without success. Possibly this article may stimulate interest in this tree among local residents and those engaged in oil surveys in the area.

Specimens of the ripe fruits, and notes on the habit and size of the tree, with particulars of the bark and timber are urgently required by the State Herbarium.

The name *lamprocalyx* comes from the Greek *(lampros*—brillant) and refers to the shining purple of the flower-buds.

On April 29, 1905, W. V. Fitzgerald, who was attached to the Crossland Trigometrical Survey of that year, travelled with the party from Native Well near Derby to "a camp about half a mile from Meda Station homestead."

The route traversed the flats of the May River, several lagoons being passed which were covered with aquatic vegetation and the resort of ducks, ibises and other birds.

Fitzgerald collected 75 plant specimens including this one which he incorrectly named *Eucalyptus pyrophora* but concerning which he gave no definite locality or notes as to habit and general appearance.

A few twigs with leaves, buds and detached flowers were collected, but no fruits.

The tree is apparently a small one with moderately thick opposite or alternate leaves, which are a slightly darker green above than below. Branches are angular and the leaf-stalks very short and compressed (flattened).

The flower-buds are about half an inch long, purplish and lustrous, the operculum being short with a small boss-like apex. The filaments are white.

The plate is prepared from the original material and shows the twigs and buds.

No. 34—*Eucalyptus Cliftoniana* W. V. Fitzg.

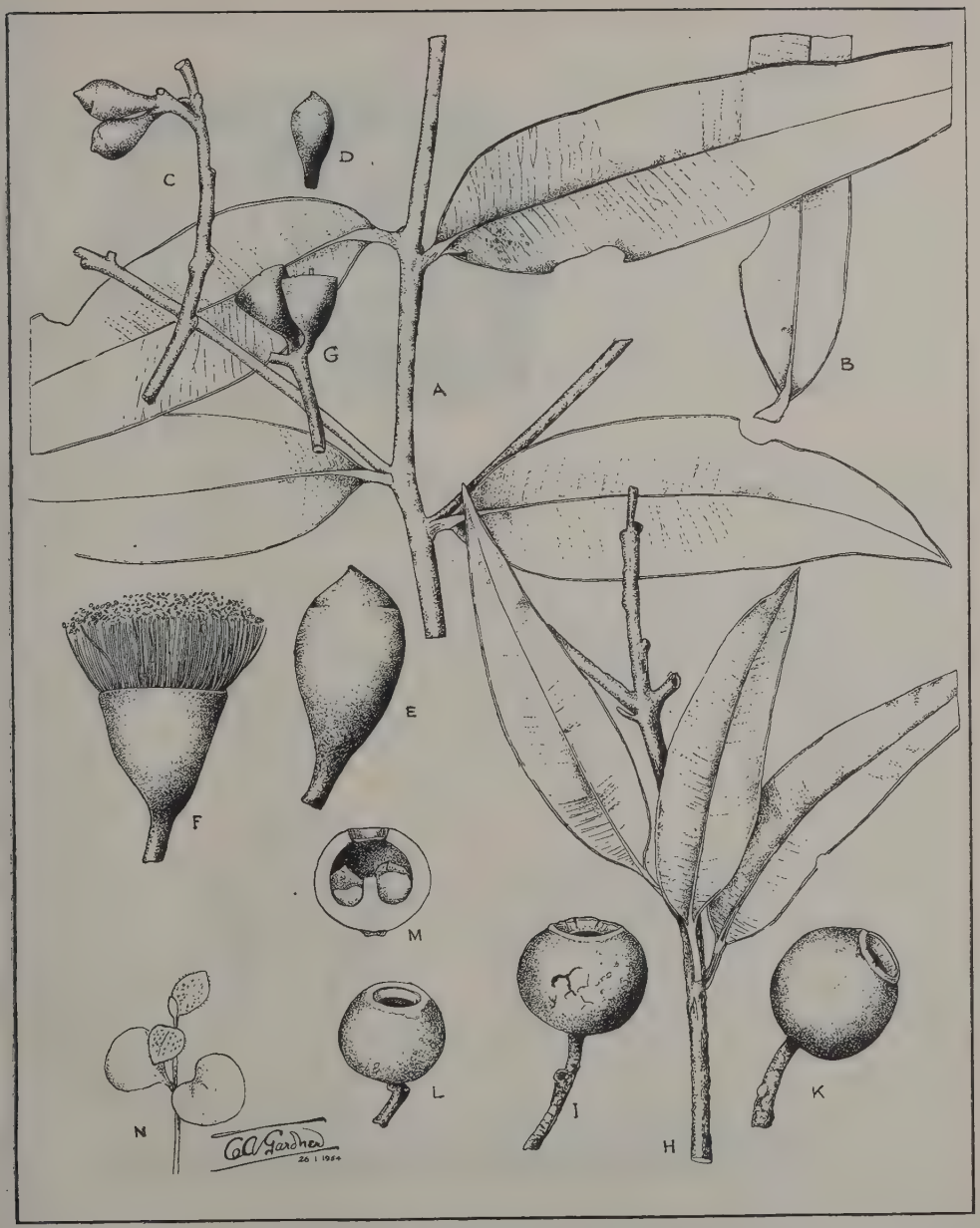
This species grows at Mount Anderson among sandstone rocks, and Fitzgerald also recorded it from the Grant and Packhorse Ranges and from the summit of Bold Bluff in the King Leopold Range. What appears to be the same species (it has not been seen in fruit) occurs on the red sandy country between Margaret River and Bohemia Downs Stations. It has also been collected on Carlton Station near the Northern Territory boundary.

We possess neither flowering nor fruiting material in the State Herbarium, and suitable specimens would be appreciated.

The tree is named after R. C. Clifton, a former Under-Secretary for Lands in Western Australia. It is a bloodwood attaining a height of about 30ft. with a rough, persistent bark throughout. The bark is scaly-fibrous, friable and somewhat tesselated and is reddish or grey in colour.

The branches are mostly spreading or drooping and the leaves narrow, green and lustrous.

The flowers are white, in rather large, corymbose panicles, and the woody fruit is globular—often broader than its length—on a very short stalk. The thick rim slopes inward. The seeds are reddish-brown and winged.



A to G inclusive—Eucalyptus lamprocalyx W. F. Blakely

A—Branchlet with leaves; B—Lower part of leaf showing distinctive leaf-stalk; C and D—Flower-buds; E—Flower-bud, slightly enlarged; F—Flower; G—Calyx after flowering. Meda Station, Lennard River. W. V. Fitzgerald 416, April 1905

H to N inclusive—Eucalyptus Cliftoniana W. V. Fitzg.

H—Branchlet with leaves; I, K and L—Fruits; M—Fruit in section; N—Cotyledons. Mount Anderson. W. V. Fitzgerald

Icon. origin.

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★
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FERTILISERS

THE Fertiliser Act, 1928-1953, requires all fertilisers sold in this State to be registered annually, the registration year commencing on 1st November each year. A list of fertilisers registered for the current registration year appears in this issue. Departmental inspectors carry out regular inspection and samplying of fertilisers to see that those offered for sale comply with requirements of the Fertiliser Act, including the registered analysis. The knowledge that this work is being carried out, induces manufacturers to maintain their fertilisers close to and usually a little above the registered standard.

From the fertilisers registered unit values, i.e., the average commercial value of each one per cent. of a given ingredient per ton of fertiliser, have been calculated for the various forms of the main fertilising ingredients, nitrogen, phosphoric acid and potash. These values are arrived at from the average of prices quoted for each fertiliser at the time of registration and are as follows:—

	s.	d.
Nitrogen (N) as—		
Blood, Blood and Bone, Bone Dust and other animal fertilisers	81	4
Nitrate	47	2½
Ammonia	37	5½
Phosphoric Acid (P_2O_5) as—		
Water soluble in superphosphate	12	3
Citrate soluble in superphosphate	12	3
Acid soluble in superphosphate and rock phosphate	5	9½
Blood and Bone, Bone Dust and other animal fertilisers	20	4
Potash (K_2O) as—		
Sulphate	16	4
Muriate (Chloride)	11	10

From unit values a comparison of the commercial value of fertilisers of similar types can be made. As will be appreciated however, it is not possible to compare, say for example, the value of nitrogen in blood and bone with that in sulphate of ammonia.

It should be remembered that unit values are average values arrived at from the prices of all fertilisers registered. The commercial values arrived at from the use of these figures will therefore in some cases be more and in others less than the actual selling price. Other points to be borne in mind are fluctuations which may occur during the year in market values and in the case of mixed fertilisers, e.g., potato manures, the cost of mixing and extra handling which must be added to figures arrived at from the use of unit values.

To calculate the value of a fertiliser from unit values the percentage of each ingredient in the fertiliser should be multiplied by its unit value and the results for each ingredient in the fertiliser totalled. An example of how this can be done and how a comparison of values can be made between fertilisers of similar types is as follows:—

	Nitrogen %	Phosphoric Acid %
X Brand Blood and Bone	6.5	10.0
Y Brand Blood and Bone	5.5	13.0

The unit values of Nitrogen and Phosphoric Acid in Blood and Bone as set out above are 81s. 4d. and 20s. 4d. respectively. The comparative commercial value of X and Y Brand Blood and Bones would therefore be:—

X BRAND BLOOD AND BONE

	s.	d.
6.5 units of nitrogen @ 81s. 4d. per unit	528	8
10.0 units of phosphoric acid @ 20s. 4d. per unit	203	4
Total value	732	0

Y BRAND BLOOD AND BONE

	s.	d.
5.5 units of nitrogen @ 81s. 4d. per unit	447	4
13.0 units of phosphoric acid @ 20s. 4d. per unit	264	4
Total value	711	8

The fertilising ingredients contained in X Brand are worth more than those in Y Brand and therefore if the two fertilisers were offered for sale at the same price the X Brand would obviously be the most economical to purchase.

Buyers of fertilisers are advised to consult the list of registered fertilisers and to ensure that packages containing fertilisers are correctly branded, i.e., carry a copy of the registered brand and name, before purchasing same.

If any doubts about a fertiliser arise inquiries should be made at the Department of Agriculture where information on the provisions and requirements of the Fertiliser Act and advice on matters concerning the use of fertilisers can be obtained.

The following fertilisers have been registered at the Department of Agriculture under the Fertiliser Act, 1928-53 for the year commencing 1st November, 1954.

Name of Fertiliser.	Reg. No.	Brand.	By Whom Registered.	Nitrogen (N) as				Phosphoric Acid (P^2O^5) as				Potash (K^2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P).
				Nitrate.	Ammonia.	Blood and Bone.	Bone Dust.	Water Soluble.	Citrate Soluble.	Acid Soluble.	Total.	Sulphate.	Muriate.	
A.—MINERAL.				%	%	%	%	%	%	%	%	%	%	
1. Nitrogenous.														
(a) Nitrogen as Nitrate.														
Nitrate of Soda	15	C.S.M.L. ..	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	15·5	....	....	....	....	....	....	....	....	....	£38/7/0 (W)-P £39/0/0 (W)-G £39/0/0 (W)-B
Nitrate of Soda	81	Boans	Boans, Ltd.	16·0	....	....	....	....	....	....	....	..	.	£8/8/0 per cwt.
Sodium Nitrate	91	Faulding's	F. H. Faulding & Co., Ltd.	16·0	....	..	..	.	.	.	....	..	.	£36/0/0 (P)
Chilean Nitrate of Soda ..	117	Champion	R. Dundas Smith & Son ..	16·0	...	....	..	..	..	.	..	.	..	
(b) Nitrogen as Ammonia.														
Sulphate of Ammonia	16	I.C.I.A.N.Z.	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	20·5	....	....	....	....	....	....	....	....	£38/7/0 (W)-P £39/15/0 (W)-G £38/7/0 (W)-B
Do. do. do.	61	Blue Cross	Agricultural Products Co.	....	20·5	....	....	....	....	....	....	....	....	1/8 per 2 lb. pkt. £1/15/6 per 56lb. pkt.
Do. do. do.	82	Boans	Boans, Ltd.	....	20·5	....	....	....	....	....	....	....	....	£4/14/6 per 187lb. bag 4/– per 7 lb. pkt.
Ammonium Nitrate ...	92	Faulding's	F. H. Faulding & Co., Ltd.	30·0		....	..	..	.	.	..	.	.	£7/19/0 per cwt.
Sulphate of Ammonia	93	do. ...	do. do. do.	....	20·0	....	....	....	....	....	....	....	....	£2/12/0 per cwt.
Do. do. do.	122	David Grays	David Gray & Co., Ltd.	....	20·5	....	....	....	....	....	....	....	....	1/8 per 2lb. pkt. 5/3 per 7lb. pkt.
(c) Nitrogen as Urea.														
Urea—N46	62	Blue Cross	Agricultural Products Co.	....	46·0†	....	....	....	....	....	....	....	....	2/6 per ½lb. 16/11 per 7lb.
Nitrogen Fertiliser	104	Grofast	Commercial Chemical Co.	....	45·0†	....	....	....	....	....	....	....	....	4/6 per 1lb.
Urea	139	Ureafol	Imperial Chemical Industries of Australia and New Zealand, Ltd.	....	46·0†	....	....	..	....	...	..	...	....	£90/15/0 (P)
2. Phosphatic.														
(a) Rock Phosphate.														
Ground Phosphate Rock	17	C.S.M.L.	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	..	....	....	....	..	36·6	36·6	.	....	£10/12/0 (W)-B
Do. do. do.	18	Sickle	do. do. do.	....	....	....	....	....	....	36·6	36·6	....	....	£10/12/0 (W)-P
Do. do. do.	19	Mount Lyell as ML in diamond	do. do. do.	....	....	....	....	....	....	36·6	36·6	....	....	£10/12/0 (W)-P

Do. do. do.	148	A in Diamond	Albany Superphosphate Co. Pty., Ltd'	....	....	....	....	....	....	....	36·6	36·6	....	£10/12/0 (W)
(b) *Superphosphate.*														
Super	1	Cresco	Cresco Fertilisers (W.A.), Ltd.	....	..	....	..	17·0	3·0	3·0	23·0	..	....	£13/2/9 (W)
Superphosphate 23%	20	C.S.M.L. ...	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	....	....	....	17·0	3·0	3·0	23·0	..	..	£13/2/9 (W)
Florida Superphosphate 23%	21	Sickle	do. do. do.	..	....	....	....	17·0	3·0	3·0	23·0	....	....	£13/2/9 (W)
Superphosphate 23%	22	Mount Lyell as ML in diamond	do. do. do.	....	....	....	....	17·0	3·0	3·0	23·0	..	....	£13/2/9 (W)
23 % Superphosphate	146	Cresco	Cresco Fertilisers (W.A.), Ltd.	....	....	....	....	17·0	3·0	3·0	23·0	....	..	£13/2/9 (W)
Superphosphate 23%	149	A in Diamond	Albany Superphosphate Co. Pty., Ltd.	....	....	....	..	17·0	3·0	3·0	23·0	....	...	£13/2/9 (W)
Superphosphate	63	Blue Cross	Agricultural Products Co.	....	....	....	....	17·0	3·0	3·0	23·0	...	..	2/3½ per 7lb. pkt. £1/5/6 per 112lb. pkt.
Do. do.	83	Boans	Boans, Ltd.	....	....	....	....	17·0	3·0	3·0	23·0	...	.	
(c) *Rock Phosphate and Superphosphate.*														
50/50 Mixture	2	Cresco	Cresco Fertilisers (W.A.), Ltd.	....	....	....	....	8·5	1·5	20·0	30·0	..	..	£12/7/4 (W)
50/50 Mixture	23	C.S.M.L.	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	..	....	....	8·5	1·5	20·0	30·0	....	....	£12/7/4 (W)
Do.	24	Mount Lyell as ML in diamond	do. do. do.	....	....	....	....	8·5	1·5	20·0	30·0	....	....	£12/7/4 (W)
Do.	150	A in Diamond	Albany Superphosphate Co. Pty., Ltd.	....	....	....	....	8·5	1·5	20·0	30·0	....	....	£12/7/4 (W)
(d) *Superphosphate and Minor Elements.*														
Super and Copper Sulphate	3	Cresco	Cresco Fertilisers (W.A.), Ltd.	....	....	....	Copper 1·25	16·0	2·75	2·75	21·5	....	....	£19/19/11 (W)
Super and Copper Ore No. 2	4	do.	do. do. do.	....	....	....	1·0	13·0	2·25	3·75	19·0	....	....	£15/0/3 (W)
Super and Zinc Oxide	5	do.	do. do. do.	....	....	Zinc 1·15	....	16·5	2·75	3·25	22·5	....	....	£14/12/11 (W)
Super, Copper Ore and Zinc Oxide	6	do.	do. do. do.	....	....	1·15	1·0	12·75	2·25	3·5	18·5	....	....	£16/0/3 (W)
Super Manganese	7	do.	do. do. do.	....	Manganese 3·8	....	....	14·5	2·5	2·5	19·5	....	....	£23/12/3 (W)
Super and Molybdenum	8	do.	do. do. do.	Molybdenum trace	....	....	....	17·0	3·0	3·0	23·0	....	....	£15/16/5 (W)
Super and Minor Elements	9	do.	do. do. do.	....	2·25	2·25	0·8	11·75	2·5	2·25	16·5	....	....	£22/16/1 (W)
Super and Copper Ore	25	C.S.M.L.	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	....	....	1·0	13·0	2·25	3·75	19·0	....	..	£15/0/3 (W)
Super and Zinc	26	do.	do. do. do.	....	....	2·5	....	16·0	2·75	2·75	21·5	...	..	£16/2/4 (W.
Super and Zinc No. 2	27	do.	do. do. do.	....	....	1·15	....	16·5	2·75	3·25	22·5	....	....	£14/12/11 (W)
Super, Copper Ore and Zinc	28	do.	do. do. do.	....	....	1·15	1·0	12·75	2·25	3·5	18·5	....	....	£16/0/3 (W)
Super and Manganese	29	do.	do. do. do.	....	3·8	....	....	14·5	2·5	2·5	19·5	....	....	£23/12/3 (W)
Super and Copper Ore	30	Sickle	do. do. do	....	....	....	1·0	13·0	2·25	3·75	19·0	....	..	£15/0/3 (W)
Super and Zinc No. 2	31	do.	do. do. do.	....	....	1·15	....	16·5	2·75	3·25	22·5	....	....	£14/12/11 (W)
Super, Copper Ore and Zinc	32	do.	do. do. do.	....	....	1·15	1·0	12·75	2·25	3·5	18·5	....	....	£16/0/3 (W)
Super and Manganese	33	do.	do. do. do.	....	3·8	....	....	14·5	2·5	2·5	19·5	....	....	£23/12/3 (W)
Super and Copper Ore ...	151	A in Diamond	Albany Superphosphate Co. Pty. Ltd.	....	....	....	1·0	13·0	2·25	3·75	19·0	....	....	£15/6/11 (W)
Super and Zinc No. 2	152	do. do.	do. do. do.....	....	....	Zinc. 1·15	....	16·5	2·75	3·25	22·5	...	....	£14/12/11 (W)
Super, Copper Ore and Zinc	153	do. do.	do. do. do.	....	....	1·15	1·0	12·75	2·25	3·5	18·5	..	....	£16/6/11 (W)
Super and Manganese	154	do. do.	do. do. do.	....	Manganese 3·8	....	....	14·5	2·5	2·5	19·5	....	....	£23/12/3 (W)

P denotes Perth G denotes Geraldton B denotes Bunbury † Nitrogen as Urea.

Name of Fertiliser.	Reg. No.	Brand.	By Whom Registered.	Nitrogen (N) as				Phosphoric Acid (P^2O^5) as				Potash (K^2O) as		Cash Price per ton at Works (W) or on Rails at Perth (P).
				Nitrate.	Ammonia.	Blood and Bone.	Bone Dust.	Water Soluble.	Citrate Soluble.	Acid Soluble.	Total.	Sulphate.	Muriate.	
				%	%	%	%	%	%	%	%	%	%	
(e) *Superphosphate and D.D.T.*				D.D.T.										
D.D.T. Superphosphate	34	C.S.M.L.	do. do. do.	0·5	....	..	....	16·0	2·75	3·0	21·75	..	....	£20/19/3 (W)
Do. do.	35	Sickle	do. do. do.	0·5	..	..	....	16·0	2·75	3·0	21·75	..	..	£20/19/3 (W)
Super and D.D.T. Mixture	121	Cresco	Cresco Fertilisers (W.A.) Ltd.	0·5	..	....	....	16·0	2·75	3·0	21·75	..	....	£20/19/3 (W)
D.D.T. Superphosphahte	155	A in Diamond	Albany Superphosphate Co. Pty., Ltd.	0·5		..	..	16·0	2·75	3·0	21·75	..	..	£20/19/3 (W)
3. Potassic.														
(a) *Potash as Sulphate*														
Sulphate of Potash	36	Sun	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	....	....	....	....	....	....	....	48·0	....	£39/3/6 (W)-P £42/0/0 (W)-G
Do. do.	84	Boans	Boans, Ltd.	....	....	....	....	....	....	....	....	48·0	..	£40/0/0 (W)-B
(b) *Potash as Muriate.*														
Muriate of Potash	37	Sun	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	....	....	....	....	....	....	....	....	58·0	£32/15/0 (W)-P
Do. do.	85	Boans	Boans, Ltd.	....	....	....	....	....	....	....	....	....	58·0	£33/12/6 (W)-B.
Do. do.	108	Wesfarmers	Westralian Farmers Co-op., Ltd.	....	....	....	....	....	....	....	....	....	58·0	£4/4/0 per 187lb. bag 3/9 per 7lb. pkt.
Do. do.	116	Giant	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	....	....	....	....	....	....	....	....	54·0	£34/17/6 (P)
				....	....	....	....	....	....	....	....	....	58·0	£32/15/0 (W)-P £33/12/6 (W)-B
4. Nitrogen and Phosphoric Acid.														
Potato Manure C	10	Cresco	Cresco Fertilisers (W.A.), Ltd.	....	3·5	....	....	14·0	2·5	2·25	18·75	....	....	£19/5/2 (W)
Do. do. C	38	C.S.M.L.	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	3·5	....	....	14·0	2·5	2·25	18·75	....	....	£19/10/1 (W)-G £19/5/2 (W)-B
Do. do. C	39	Sickle	do. do. do.	....	3·5	.	.	14·0	2·5	2·25	18·75	....	..	£19/5/2 (W)-P
Do. do. C	40	Mount Lyell as ML in diamond	do. do. do.	..	3·5	.	....	14·0	2·5	2·25	18·75	..	..	£19/5/2 (W)-P
Do. do. C	156	A in Diamond	Albany Superphosphate Co. Pty., Ltd.	....	3·5	...	....	14·0	2·5	2·25	18·75	....	..	£19/5/2 (W)
Lawn Manure	74	Dawn	Dawn Fertilisers	....	8·54	....	....	9·23	1·36	0·82	11·4	....	.	
Plant Food	75	do.	do. do.	....	5·23	....	....	11·21	1·41	1·46	14·08	....	..	
5. Nitrogen, Phosphoric Acid and Potash.														
Potato Manure A	11	Cresco	Cresco Fertilisers (W.A., Ltd.	....	2·5	....	....	13·25	2·25	2·5	18·0	....	5·0	£19/15/7 (W)
Potato Manure B	12	do.	do. do. do.	....	3·5	...	..	12·5	2·0	2·25	16·75	..	5·0	£21/1/7 (W)
Potato Manure E	13	do.	do. do. do.	....	3·5	..	..	11·5	2·0	2·0	15·5	..	8·0	£22/3/4 (W)
Orchard Manure	14	do.	do. do. do.	..	3·5	..	....	12·5	2·0	2·25	16·75	....	5·0	£21/1/7 (W)
Potato Manure A	41	C.S.M.L.	Cuming Smith & Mt. Lyell Farmers Fertilisers, Ltd.	....	2·5	.	...	13·25	2·25	2·5	18·0	...	5·0	£19/7/1 (W)-B
Potato Manure A2	42	do.	do. do. do.	....	2·5	....	....	13·25	2·25	2·5	18·0	5·0	....	£21/0/8 (W)-B £21/0/8 (W)-G
Potato Manure B	43	do.	do. do. do.	..	3·5	....	...	12·5	2·0	2·25	16·75	....	5·0	£21/3/1 (W)-B
Potato Manure E	44	do.	do. do. do.	....	3·5	..		11·5	2·0	2·0	15·5		8·0	£22/5/10 (W)-B
Potato Manure E2	45	do.	do. do. do.	...	3·5	...	.	11·5	2·0	2·0	15·5	8·0	..	£24/13/8 (W)-G
Orchard Manure	46	do.	do. do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	...	5·0	£21/13/1 (W)-B

Tomato Manure	47	C.S.M.L.	Cuming Smith & Farmers Fertilisers, Ltd.	Mt. Lyell	....	3·5	....	....	10·25	1·5	2·0	13·75	10·0	....	£26/1/7 (W)-G
Tobacco Fertiliser	48	do.	do.	do. do.	3·3		.... Zinc trace	.... copper trace	11·5	2·0	2·25	15·75	5·7	....	£23/0/6 (W)-B
Tobacco Fertiliser No. 2	49	do.	do.	do. do.	3·3				11·0	2·0	2·0	15·0	5·7	....	£23/6/0 (W)-B
Garden Fertiliser	50	do.	do.	do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£22/5/10 (W)-B
Potato Manure A	51	Sickle	do.	do. do.	....	2·5	....	....	13·25	2·25	2·5	18·0	....	5·0	£19/15/7 (W)-P
Potato Manure B	52	do.	do.	do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£21/1/7 (W)-P
Potato Manure E	53	do.	do.	do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£22/3/4 (W)-P
Orchard Manure	54	do.	do.	do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£21/1/7 (W)-P
Garden Fertiliser	55	do.	do.	do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£22/3/4 (W)-P
Potato Manure A	56	Mount Lyell as ML in diamond	do.	do. do.	....	2·5	....	....	13·25	2·25	2·5	18·0	....	5·0	£19/15/7 (W)-P
Potato Manure B	57	do.	do.	do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£21/1/7 (W)-P
Potato Manure E	58	do.	do.	do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£22/3/4 (W)-P
Orchard Manure	59	do.	do.	do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£21/1/7 (W)-P
Garden Fertiliser	60	do.	do.	do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£22/3/4 (W)-P
Potato Manure A	64	Blue Cross	Agricultural Products Co.		....	2·5	....	....	13·25	2·25	2·5	18·0	....	5·0	2/8 per 7lb. pkt. £1/12/0 per 112lb. pkt.
Potato Manure E	65	do.	do.	do. do.	....	3·5	....	....	11·5	1·25	2·75	15·5	....	8·0	2/11 per 7lb. pkt. £1/14/0 per 112lb. pkt.
Fertosol	66	do.	do.	do. do.	35·0‡		....	....	16·0	..	....	16·0	8·0*	....	2/6 per ½lb., 4/0 per 1lb.
Bulb and Corm Manure	76	Dawn	Dawn Fertilisers		....	1·9	....	....	9·2	1·4	0·8	11·4	....	9·0	
Seedling Manure	77	do.	do.	do.	....	5·3	....	....	8·75	1·25	1·0	11·0	....	4·4	
Potato Manure A	86	Boans	Boans, Ltd.		....	2·5	....	....	13·25	2·25	2·5	18·0	....	5·0	£2/1/6 per 160lb. bag. 2/1 per 7lb. pkt.
Potato Manure E	87	do.	do.	do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£2/9/0 per 160lb. bag, 2/7 per 7lb. pkt.
Growth Fertiliser Tablets	102	Summit ...	L. M. McLeod ...		4·1	...	...	...	7·0	1·2	0·1	8·3	...	12·2*	
Lawn Food	106	Dawsons	Dawson Harrison Pty., Ltd.		....	11·5	....	..	4·75	0·75	0·75	6·25	6·5	....	£33/10/4 plus bags (W)
Hylawn (1)	118	Hypon	Hydroponics Pty., Ltd.		....	16·0	....	....	50·0	..	..	50·0	....	20·0	£60/0/0 (W)
Hypon (2)	119	do.	do.	do. do.	....	4·0	....	....	5·0	....	....	5·0	....	4·0	1/6 per 20 oz. bottle.
Potato Manure A	123	David Grays	David Gray & Co., Ltd. ...		....	2·5	....	....	13·25	1·5	3·25	18·0	....	5·0	3/0 per 7lb. pkt.
Potato Manure E	124	do. ..	do.	do. do. .	..	3·5	....	..	11·5	1·25	2·75	15·5	..	8·0	3/3 per 7lb. pkt. 6/0 per 14lb. pkt.
Foli 8	143	George C. Warner's Pty., Ltd.	G. C. Warner Laboratories,		....	20·0‡	....	....	20·0	....	....	20·0	20·0*	...	
Gard-N-Tabs	144	do. do.	do.	do. do.	....	14·0	....	....	38·0	....	....	38·0	24·0*	....	
Potato Manure A	157	A in Diamond	Albany Superphosphate Co. Pty., Ltd.		....	2·5	....	....	13·25	2·25	2·5	18·0	....	5·0	£19/19/9 (W)
Do. do. B	158	do. do.	do.	do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£21/5/9 (W)
Do. do. E	159	do. do.	do.	do. do.	....	3·5	....	....	11·5	2·0	2·0	15·5	....	8·0	£22/10/1 (W)
Orchard Manure	160	do. do.	do.	do. do.	....	3·5	....	....	12·5	2·0	2·25	16·75	....	5·0	£21/5/9 (W)
Garden Fertiliser	161	do. do.	do.	do. do.		3·5		....	11·5	2·0	2·0	15·5	....	8·0	£22/10/1 (W)
6. Liquid Fertiliser.															
Liquid Fertiliser	67	Blue Cross	Agricultural Products Co.		6·5‡		....	....	5·0	..	....	5·0	3·0*	....	3/7 per pint
Concentrated Fertiliser	94	Spring	F. H. Faulding & Co., Ltd.		7·5		....	....	5·0	....	....	5·0	4·0*	....	£1/13/0 per doz., 16 oz. bottles (wholesale)
Floratone	100	Feltons	D.H.A. (Laboratories) Pty., Ltd.		10·0		....	....	10·0	....	....	10·0	5·0*	..	£1/9/3 per doz 16 oz. bottles (wholesale)
Liquid Manure	105	Rapid-Gro	Commercial Chemical Co.		14·0‡		....	...	28·0	....	..	28·0	12·0	....	4/11 per 7lb. pkt., £4/2/6 per 28lb. pkt.
Liquid Fertiliser	125	David Grays	David Gray & Co., Ltd ..		9·0		..	...	6·0			6·0	4·0*	..	4/3 per 20 oz. bottle
Liquid Manure	138	Keoghs	Wilcox Mofflin. Ltd.		1·7		....	...	1·5	..		1·5	...	2·0	36/- per doz. 20 oz. bottles.

P denotes Perth. G denotes Geraldton B denotes Bunbury * Potash as Nitrate ‡ Includes Nitrogen as Urea.

FERTILISERS—continued.

Name of Fertiliser.	Reg. No.	Brand.	By Whom Registered.	Nitrogen (N) as				Phosphoric Acid (P^2O^5) as				Potash (K^2O) as		Cash Price per ton at Works (W or on Rails at Perth (P).
				Nitrate.	Ammonia.	Blood and Bone.	Bone Dust.	Water Soluble.	Citrate Soluble.	Acid Soluble.	Total.	Sulphate.	Muriate.	
				%	%	%	%	%	%	%	%	%	%	
B.—ORGANIC.														
(a) *Blood and Bone.*														
Blood and Bone Fertiliser	68	Blue Cross	Agricultural Products Co.	....	....	5·0	....	....	3·0	9·0	12·0	....	....	3/- per 4lb. pkt. 4/6 per 7lb. pkt.
Blood and Bone....	88	Boans	Boans, Ltd.	....	....	6·0	....	....	4·0	11·0	15·0	....	....	£1/2/6 per bag (50lb).
Do. do.	95	Apex	E. J. Fry Pty., Ltd.	....	....	6·0	....	....	4·0	11·0	15·0	....	....	3/3 per 7lb. pkt.
Do. do.	98	T.B. & S. in diamond	T. Borthwick & Sons (A'sia), Ltd.	....	....	7·75	....	....	6·75	5·25	12·0	....	....	£36/6/0 (W) £36/16/0 (P)
Do. do.	101	Wyndham	Wyndham Freezing, Canning & Meat Export Works	....	....	6·0	....	....	5·5	9·5	15·0	....	....	£32/0/0 (W) wholesale £32/0/0 (P)
Blood and Bone, 5% Nitrogen	109	Wesfarmers	Westralian Farmers Co-op., Ltd.	....	....	5·0	....	....	8·85	9·9	18·75	....	....	£43/0/0 (P)
Blood and Bone....	115	Pannifex	Burridge & Warren Pty, Ltd.	....	....	5·0	....	....	6·0	8·0	14·0	....	....	£50/0/0 (P)
Blood and Bone Manure	120	Kitchens....	J. Kitchen & Sons Pty., Ltd.	....	....	6·8	....	....	9·0	5·0	14·0	....	....	£40/15/0 (P)
Blood and Bone	126	David Grays	David Gray & Co., Ltd.	....	....	5·0	....	....	....	....	9·0	....	....	£2/18/0 per cwt.
Blood and Bone Fertiliser	131	P.P.	Picton Produce Pty., Ltd.	....	....	5·0	....	....	....	15·0	15·0	....	....	£34/0/0 (W) wholesale
Do. do.	136	Eclipse	The W.A. Meat Export Works	....	....	6·0	....	....	....	....	12·0	....	....	£27/0/0 (W)
Do. do.	147	Wooltana	Wooltana Industries Ltd.	....	....	6·0	....	....	2·0	8·0	10·0	....	....	£45/0/0 (P)
(b) *Animal Fertiliser.*														
Animal Fertiliser	69	Blue Cross	Agricultural Products Co.	....	....	3·5	....	....	3·0	9·0	12·0	....	....	2/4 per 4lb. pkt.
Do. do.	99	A.N.A. Surprise	C. A. Kirkby & Sons	....	....	5·0	....	....	4·0	10·0	14·0	....	....	£2/8/0 per 112lb. pkt.
Whale Fertiliser	107	Cheynes Beach	Cheynes Beach Whaling Co. Pty., Ltd.	....	....	6·8	....	....	4·2	6·1	10·3	....	....	£37/0/0 (P) £30/0/0 (P) wholesale
Animal	111	Wooltana	Wooltana Industries, Ltd.	....	....	4·0	....	....	1·0	8·15	9·15	....	....	£28/10/0 (P)
Animal Fertiliser ...	112	do.	do. do. do.	....	....	4·0	....	....	1·0	8·15	9·15	....	....	£28/10/0 (P)
Garden Fertiliser	137	Eclipse	The W.A. Meat Export Works	....	....	4·0	....	....	....	....	6·0	....	....	£25/0/0 (W)
Animal Fertiliser	140	Cloverdale	Cloverdale Fertilisers	....	....	4·0	....	....	....	....	16·0	....	....	£32/0/0 (W)
Do. do.	142	Wrights	Wrights Limited	....	....	6·0	....	....	....	....	7·0	....	....	£38/10/0 (P)
Do. do.	145	Midland	Midland Junction Abattoir Board	....	....	8·0	....	....	....	....	5·0	....	....	£20/0/0 (W)
(c) *Organic Fertiliser.*														
Fertiliser	103	Sprout-em	Kag Manufacturing Co.	....	....	2·5	....	....	5·0	4·0	9·0	....	....	
(d) *Blood Meal Fertiliser.*														
Dried Blood	110	Wesfarmers	Westralian Farmers Co-op., Ltd.	....	....	12·0	....	....	....	....	....	....	....	£80/0/0 (P)
(e) *Bone Dust Fertiliser.*														
Bone Dust	141	Cloverdale	Cloverdale Fertilisers	....	....	....	2·5	....	....	....	20·0	....	....	£22/0/0 (W)
C.—MIXED MINERAL AND ORGANIC.														
Special Garden Fertiliser	70	Blue Cross	Agricultural Products Co.	....	4·0‡		....	3·0	3·0	6·0	12·0	2·5	....	2/6 per 4lb. pkt. £2/8/6 per 112lb. pkt.

Lawn Manure	71	do.	do. do. do.	...	4·0‡	....	3·0	3·0	6·0	12·0	2·0	....	2/4 per 4lb. pkt.
													£2/8/0 per 112lb. pkt.
Rose Bush Fertiliser	72	do.	do. do. do.	...	4·0‡	....	2·5	5·0	10·0	3·0	....	2/6 per 4lb. pkt.
													£2/8/6 per 112lb. pkt.
Rose Manure	78	Dawn	Dawn Fertilisers	...	5·9§	...	10·3	1·52	0·91	12·7	....	1·64	
No. 1	79	Superhumus	do. do.	...	2·0§	...	1·8	0·5	0·2	2·5	....	2·0	
No. 2	80	do.	do. do.	...	4·0§	...	3·0	0·5	0·5	10·0	....	0·5	
Special Mixed Rose Manure	89	Boans	Boans, Ltd.	...	3·0	...	....	....	....	14·0	....	9·0	12/8 per 28lb. pkt.
													3/6 per 7lb. pkt.
Do. do. Lawn do....	90	do.	do.	...	5·0	...	....	....	....	15·0	....	....	£1/4/6 per 56lb. pkt.
													3/9 per 7lb. pkt.
No. 1 Fertiliser	96	Apex	E. J. Fry Pty., Ltd.	...	5·0	...	3·0	1·5	4·5	9·0	....	2·0	£35/0/0 (P)
Rose Manure	97	do.	do. do.	...	5·0	3·0	5·0	2·0	6·0	13·0	....	9·0	£38/0/0 (P)
No. 2	113	Wooltana	Wooltana Industries, Ltd.	...	2·0	...	2·0	....	9·0	11·0	....	....	£24/0/0 (P)
Garden Fertiliser	114	Cormo	Nor-West Fertilisers	...	4·0	...	3·0	1·0	2·0	6·0	....	....	£25/0/0 (W)
Powdered Fertiliser	127	David Grays	David Gray & Co., Ltd.	...	5·6	...	2·8	1·03	2·1	5·93	....	3·2	4/0 per 7lb. pkt.
													7/9 per 14lb. pkt.
Rose Manure	128	do.	do. do. ..	...	5·6	...	2·8	1·03	2·1	5·93	....	3·2	4/3 per 7lb. pkt.
													8/0 per 14lb. pkt.
Lawn Fertiliser	129	do.	do. do.	...	5·6	...	2·8	1·03	2·1	5·93	....	3·2	4/0 per 7lb. pkt.
													7/9 per 14lb. pkt.
Fertiliser	130	Clarksons	Clarksons (W.A.), Pty., Ltd.	...	5·6	...	2·8	1·03	2·1	5·93	....	3·2	4/3 per 7lb. pkt.
Top Dressing Fertiliser	132	P.P.	Picton Produce Pty., Ltd.	...	2·75	...	7·5	....	14·0	21·5	....	....	£24/10/0 (W) whole-sale
Orchard Manure	133	do.	do. do.	...	2·75	...	7·5	....	14·0	21·5	....	2·0	£24/10/0 (W) whole-sale
Garden Fertiliser	134	do.	do. do.	...	2·75	...	7·5	....	14·0	21·5	....	2·0	£24/10/0 (W) whole-sale
Potato Manure	135	do.	do. do.	...	2·75	...	7·5	....	14·0	21·5	....	2·5	£24/10/0 (W) whole sale

P denotes Perth G denotes Geraldton B denotes Bunbury. ‡ Includes Nitrogen as Urea § Includes Nitrogen as Sludge.

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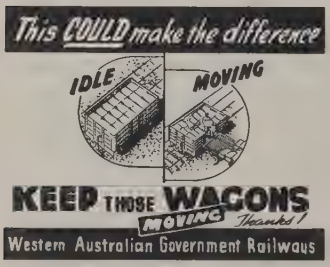

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AS CUNNING AS A FOX

By A. R. TOMLINSON,
Chief Vermin Control Officer

"AS cunning as a fox" is a popular saying, but are foxes as cunning as the words imply? After all, they are not really difficult to destroy. I think all farmers will agree that foxes are always a serious menace at lambing time, and everything possible should be done to keep them in check, particularly in a season such as this when the breeding ewes will possibly be weakened.

Farmers should commence planning their campaigns immediately. The most important thing is to act before the damage is done, and not wait for killed lambs, or reduced lambing percentages. A heavy baiting campaign a month or two before lambing will be found a good insurance. If this coincides with the driest time of the year when natural food for the foxes is scarce and baits are doubly attractive, so much the better.

Foxes have a weakness which may be exploited. They are greedy eaters, and will tackle almost anything edible from beetles even to sea-weed. They eat all kinds of meat, fish, fruit and vegetables, and will readily fall for carefully made and placed baits.

Well prepared baits made of meat and fat, including liver, kidneys, corned beef, suet and brisket are excellent while parrots, small birds, heads of poultry, eggs, butter and sardines are very good. Possibly the best general purpose baits are made from fats or fatty meat.

The baits need not be very large, about ¾in. to 1in. cubes are sufficient, but large numbers of them are required.

Each bait should contain at least a third of a grain of strychnine, and the half-grain tablets now being manufactured are excellent for the purpose. The tablets have the advantage of containing a measured dosage, and are easily handled.

If powdered or crystal strychnine is to be used, remember that a third of a grain covers a three-penny bit, or a quarter-inch of the small blade of a pocket knife. Use alkaloid strychnine in preference to soluble strychnine, and take great care to ensure that all of it is well inside the baits. If any strychnine touches the outside, it will be noticeable to a fox.

The signs and tracks left by foxes are the best guide to where the baits should be placed. Travelling routes, such as paths and waterways leading into properties should be well baited. Baits should be placed near any carcasses which might be lying around, and in the vicinity of watering places in dry weather.

Many farmers drag trails using a sheep's paunch or the carcass of a sheep, kangaroo or emu, preferably one that has been slightly singed or scorched. Baits are placed along the trails. Other farmers maintain depots where waste foods, bones, offal and other rubbish are dumped to establish regular feeding places for the foxes. Whenever necessary, some of the food may be poisoned or poisoned baits spread around.

I know that many farmers fear to bait because of farm dogs. However, if the baits are placed where any left may be picked up later, and the dogs muzzled and chained during a poisoning drive, there should be little danger. Quite a number of dogs are trained to ignore baits and this is always a wise precaution.

Hundreds of foxes are destroyed by shooting, trapping and hunting with dogs. However, our fox population has now reached millions, and the breeding rate is so rapid that these methods do not go far enough.

Wholesale baiting is the only really effective mass destruction method. To obtain the best results the campaigns should be well planned and organised on a district-wide basis.

Farmers, you can protect your lambs from foxes by wholesale baiting. I suggest that it is in your interests to arrange for district-wide drives to be organised by your vermin board, the local branch of the Farmers' Union or any other organisation.

(From a broadcast talk given over 6WF. Published by courtesy of the Australian Broadcasting Commission.)

CLOVER SEED PRODUCTION

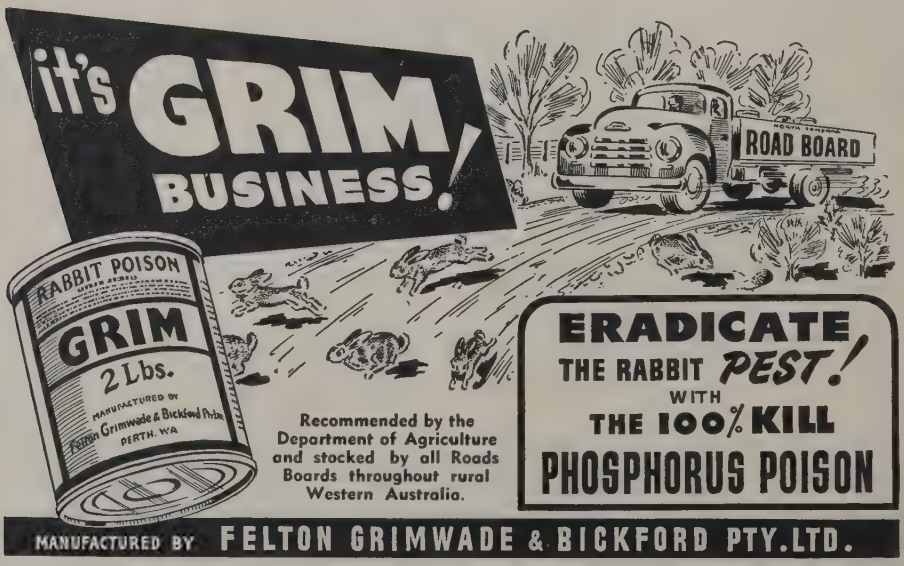
Up to March 15 of this year, the Department of Agriculture had certified 363 tons of subterranean clover seed, made up of 154 tons of Dwalganup strain, 169 of Mount Barker, three of Tallarook, 36 of Yarloop and one ton of Bacchus Marsh.

Up to the same period last year 873 tons had been certified and the total for the season was 1,616 tons made up of 1,141 tons Dwalganup, 306 tons Mount Barker, 165 tons Yarloop, three and a quarter tons Tallarook and three-quarters ton Bacchus Marsh.

Questioned as to the likely total of the 1955 harvest, the Officer-in-Charge, Weeds and Seeds Branch, Mr. G. R. W. Meadly, said that he did not expect to certify more than another 100 tons so that the estimated total yield this year would be less than a third of last year's output.

He said that the heavy February rains had halted clover seed harvesting in all districts and although some rolling was resumed following a period of fine weather, the majority of producers did not recommence harvesting.

As the main seed production areas in New South Wales and South Australia had been affected by unseasonable rains, an Australia-wide shortage of subterranean clover seed was to be expected during the coming sowing season.



A normal doublegee plant on the right compared with a plant affected with 2,4-D. Although the sprayed plant has received a check in growth and the characteristic swelling is present, it has not been killed.

A FURTHER CHEMICAL TRIAL WITH DOUBLEGEE

(Emex Australis)

By G. R. W. MEADLY, M.Sc., Officer-in-Charge, Weeds and Seeds Branch and G. A. PEARCE, M.Sc. (Agric.), Botanist

IN the Journal of Agriculture, Vol. 3, No. 4, July-August, 1954, details were given of experimental work with doublegees and the following conclusions were reached:—

"Various formulations of 2,4-D used at a wide range of acid equivalent levels have not proved really effective against doublegees and could not be considered as a means of eradicating this plant or even causing a reduction in establishment the following year.

"As with a number of other weeds, somewhat better results have been obtained under crop than under pasture conditions. The spraying of doublegees in a crop, particularly when other susceptible weeds are present, could be an economical undertaking in areas where this weed is vigorous and strongly competitive. Although a high proportion of kill cannot be expected, 6 oz. of acid equivalent per acre of the ester of 2, 4-D has caused suppression of growth for a period and could result in considerable advantage to the crop if applied when the weeds are small. Doublegees have been affected to a greater extent by the ester than by similar quantities of the amine or sodium salt of either 2,4-D or M.C.P.A.

"The volume of solution applied does not appear to be an important factor as was suggested at one stage. Reducing the

volume from eight to four gallons, applied with a low-volume boom caused no improvement and similar results followed the application of the same quantity of active chemical in two gallons per acre by means of an aircraft.

"There is evidence to indicate that treatments are more effective in the northern portions of the wheatbelt, possibly associated with more rapid growth in the early part of the season. This apparent advantage is offset by the fact that in those districts doublegee tends to germinate over a longer period."

FURTHER TRIALS

Following on some field observations it was decided to undertake further trials in 1954 based on two similar chemical applications to the same area, the second to be applied a short period after the first. The chemicals used were the amine salt and ethyl, butoxyethanol and alkyl-hexyl esters of 2, 4-D. Each was applied at the rates of 6, 12 and 16 ounces of acid equivalent in seven gallons of water per acre. Each treatment was replicated three times and 12ft of the initial 24ft. wide plot was resprayed two weeks after the first application. The trial was undertaken at the Chapman Research Station and at Beverley.

CHAPMAN RESEARCH STATION

The various treatments were applied to doublegees in a wheat crop on 21st July, 1954, when the crop was stooling and about 9in. high and the doublegees were 4-10 in. in diameter. Spraying was carried out in warm sunny weather after eight points of rain had fallen the previous day. There was a further ten points the day after spraying. Owing to the rapid growth of the crop, and in order to avoid the vulnerable "boot" stage, the second application to half of each plot was made nine days after the initial treatment, 46 points of rain fell the next day. The plant mortality resulting from the treatments is shown in the accompanying table.

All doublegee plants showed effects of 2, 4-D and the final counts were made at a time when further recovery could not be expected. Some of the plants regarded as having survived would not have produced mature seeds. A high degree of control was obtained from all treatments including six ounces acid equivalent per acre, the rate used frequently for wild radish. A double application at that level gave complete control.

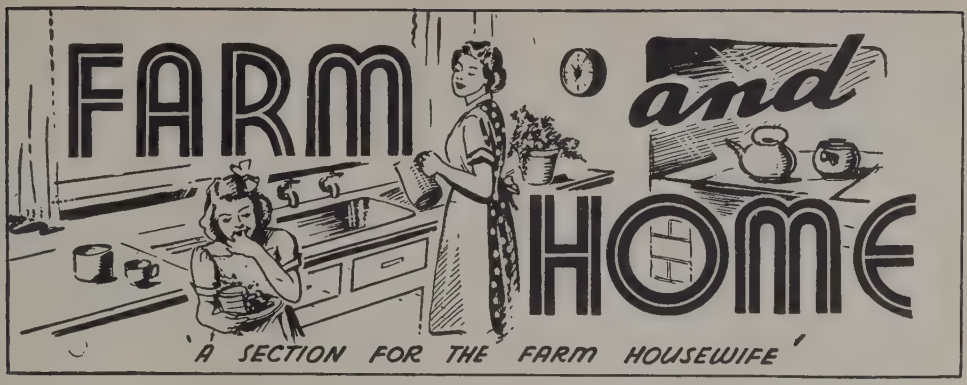
	Treatment.	% Plants Killed.	
		Single Application	Double Application
1.	6 ozs. Amine Salt	83	100
2.	12 ozs. Amine Salt	95	100
3.	16 ozs. Amine Salt	96	100
4.	6 ozs. Ethyl Ester	85	100
5.	12 ozs. Ethyl Ester	96	100
6.	16 ozs. Ethyl Ester	99	100
7.	6 ozs. Butoxyethanol Ester	91	100
8.	12 ozs. Butoxyethanol Ester	94	100
9.	16 ozs. Butoxyethanol Ester	100	100
10.	6 ozs. Alkyl-hexyl Ester	93	100
11.	12 ozs. Alkyl-hexyl Ester	93	100
12.	16 ozs. Alkyl-hexyl Ester	97	100
13.	Control	....	....

BEVERLEY

The same experiment was repeated at Beverley. The doublegees ranged in size from 2-8in. in diameter while the wheat crop was approximately 6in. in height. The first spraying was carried out on August 3rd, a cool cloudy day, and the second application was made on August 24th. Seventeen points of rain fell the day after the first treatment and a week of fine weather followed the second application. Although the growth of the doublegees was checked on all plots, particularly those which received two applications, no significant control was obtained with any treatment. The plants recovered and seeded freely.

At Beverley the second spraying was made 21 days after the first compared with an interval of nine days at Chapman. The doublegees were showing effects of the initial treatment at the time, however, and it is doubtful whether the longer period between treatments contributed to the difference in results. The more rapid growth, evident in both crop and weeds, is likely to have increased the effectiveness of the treatment at Chapman.

After a further season of experience and experimental work with doublegee, we can only repeat the conclusions made previously and stress the variability of results following spraying with 2, 4-D herbicides.



AN APPLE A DAY

By BRENDA CLEEVE

THE apple deservedly maintains its position at the top of the popularity list. The good cook welcomes this fruit as it lends itself to a variety of tasty dishes which are family favourites of long standing. Make the most of this apple season to add interest to your menus.

Here are a few salads in which apples play their part in adding variety to summer menus.

Apple and Date Salad.

Mix together 2 cups chopped apples and ½ cup stoned and chopped dates. Carefully stir in sufficient salad dressing to give a thin coating to the mixed fruits.

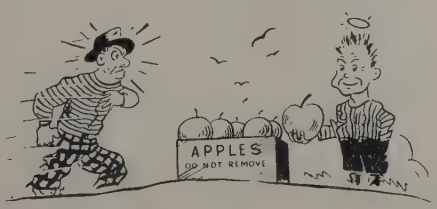
Serve in curled lettuce leaves, garnished with dates and more dressing.

Apple, Date and Walnut Salad.

Add ½ cup of chopped walnuts to the above salad.

Apple and Celery Salad.

Mix together equal quantities of finely chopped apple and celery. Sprinkle with salt and add sufficient salad dressing to bind. Serve in curled lettuce leaves.



Apple and Carrot Salad.

Mix together 1 cup chopped apple, ½ cup each of grated carrot, raisins, chopped nuts. Sprinkle with the juice of an orange. Serve in lettuce leaf cups.

Apple and Ham Salad.

Mix together ¾ cup diced ham, ¾ cup chopped apple, ½ cup chopped celery, ½ head lettuce, shredded finely. Add enough salad dressing to coat the ingredients.

SOME APPLE DESSERTS

Apple Custard (1).

4 or 5 apples.
1 banana.
Juice of an orange.
2 eggs.
½ pint milk.
Few drops lemon or orange flavouring.

Method.

1. Peel, core and quarter the apples.
2. Place in a pie dish. Sprinkle with sugar and add ½ cup water.
3. Bake until soft.
4. Add the sliced banana and orange juice.
5. Beat the eggs, add milk and flavouring.
6. Pour over the fruit in the pie dish.
7. Bake in a moderate oven until set.

Apple Custard (2).

2 eggs.
1 pint milk.
1 tablespoon sugar.
Flavouring.
1 or 2 apples.
2 tablespoons coconut.

Method.

1. Beat eggs and sugar. Add the milk and flavouring.
2. Pour into a pie dish.
3. Peel and core the apples and cut in thin slices.
4. Place the slices on top of the custard.
5. Sprinkle the coconut on top.
6. Stand pie dish in a tray of cold water.

Bake in a moderate oven until set.

N.B.—This pudding needs to be watched carefully as the coconut burns easily.

Try this method of making **Apple Charlotte.**

2 lb. apples.
¾ cup sugar.
Few strips of lemon rind.
2-3 cups bread crumbs.
Butter.

Method.

1. Stew the apples to a thick pulp with the sugar and lemon rind and as little water as possible.
2. Fry the crumbs until golden brown in butter.
3. Put the drained apples and crumbs in layers in a buttered pie dish. Finish with a layer of crumbs.
4. Bake in a moderate oven 15-20 minutes.

(Delicious served with custard or cream.)

Apple Pancakes.

2 apples.
8 oz. flour.
¾ pint milk.
2 eggs.
2 tablespoons sugar.
2 teaspoons cinnamon.

Method.

1. Peel and grate the apples.
2. Mix the sugar and cinnamon through the apples.
3. Sift flour into a basin with a pinch of salt.
4. Add egg yolk and milk and beat to a smooth cream.
5. Fold in the stiffly beaten egg whites.
6. Melt a little fat in a frying pan and, when fuming, pour in half the pancake mixture.
7. Add the layer of flavoured apple.
8. Pour the remainder of the mixture on top.
9. Cook gently on both sides until a golden brown.
10. Service sprinkled with castor sugar, to which cinnamon may be added.

Apple Blush.

1 cup sugar.
2 cups water.
Grated rind of a lemon.
Red colouring.
6 medium apples.

Method.

1. Peel and core the apples.
2. Place sugar, water, lemon rind and a few drops of red colouring into a saucepan, which should be large enough to fit the apples without overlapping.
3. Bring to the boil.
4. Place the apples in the syrup and cook them gently until tender but not mashed.
5. Lift out carefully on to a serving dish.
6. Boil the remaining liquid with the lid off the pan until it is a thick syrup.
7. When cool, pour this over the apples.

Apple Rissoles.

Left-over cold meat or fresh pork.
Grated apple.
Seasoning.
Egg and breadcrumbs.

Method.

1. Mix an equal quantity of minced cold meat or fresh pork and grated or minced apple.
2. Add salt, pepper and herbs to taste.
3. Add beaten egg to bind.

4. If the mixture is too moist, add breadcrumbs.
5. Make into small cakes and roll in egg and breadcrumbs. If sufficient egg has been used to bind the mixture, the cakes can be rolled in crumbs only.
6. Fry until a golden brown.
7. Serve with creamed potatoes.

PRESERVES

Apple and Apricot Jam.

2 lb. dried apricots.
2 lemons.
4 pints water.
5 lb. apples.
7 lb. sugar.

Method.

1. Soak the apricots in the water with two finely cut lemons for 24 hours.
2. Peel and slice 5 lb. of apples.
3. Add the apples to the apricots and boil until soft.
4. Add the sugar and boil quickly until "jell" point is reached.
5. Pour into bottles and seal.

Apple and Mint Jelly.

2 lb. windfall apples.
Sugar.
4 tablespoons chopped mint.

Method.

1. Cut apples without peeling.
2. Place in pan and almost cover with cold water. Boil for 10 minutes.
3. Add the prepared mint and boil for another 20 minutes.
4. Strain through a cloth.
5. To each cup of juice allow ½ cup sugar.
6. Boil until the jelly sets when tested.
7. Bottle and cover.

AND NOW—A NEW SAUCE

Try this ginger sauce to be served with baked and boiled apple puddings.

Ginger Sauce.

½ pint milk.
1 dessertspoon cornflour.
2 tablespoons golden syrup.
1 teaspoon butter.
½ teaspoon ground ginger.

Method.

1. Mix the ginger and cornflour and blend to a smooth paste with some of the milk.
2. Heat the remainder of the milk and pour over the blended mixture.
3. Return to the pan and bring to the boil.
4. Boil for 3 minutes. Remove from the stove.
5. Stir in the golden syrup.

REMOVING FRUIT STAINS

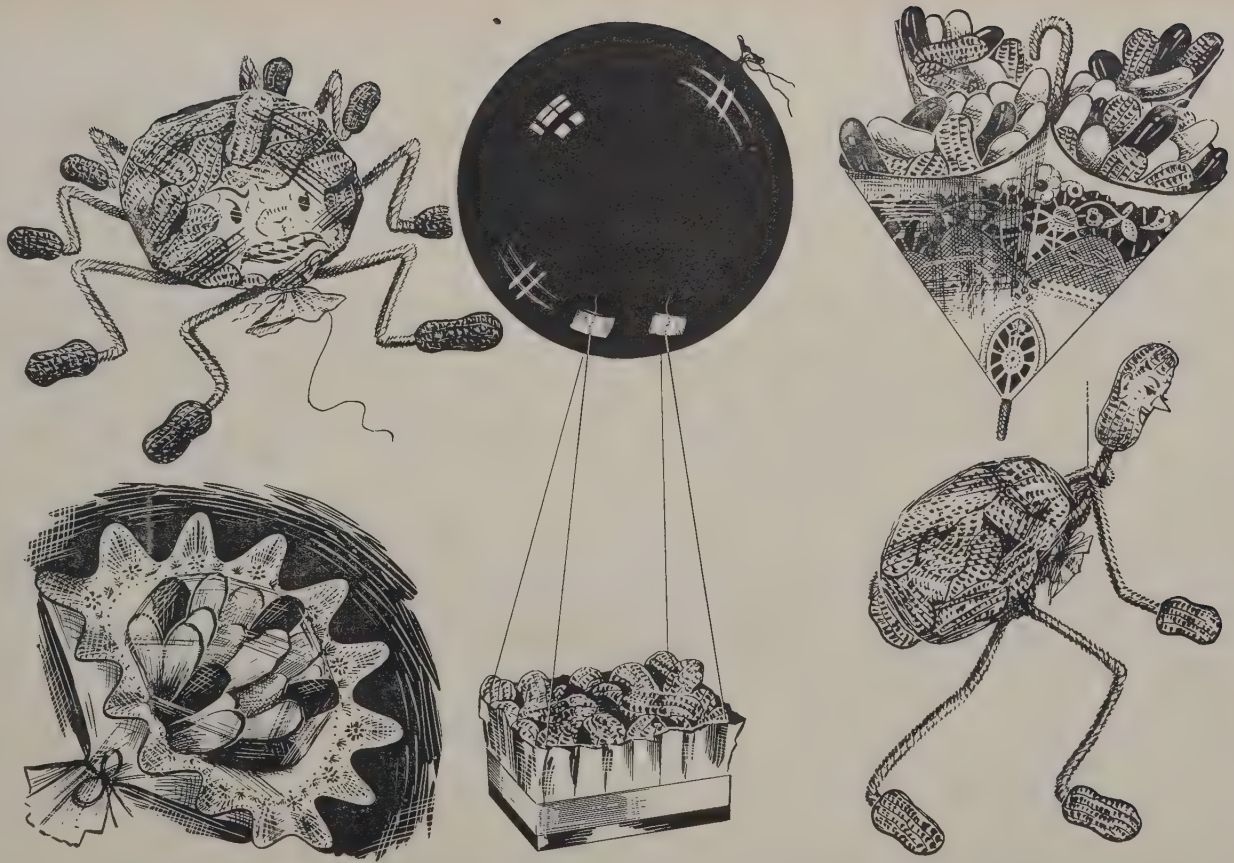
By BRENDA CLEEVE

NOW that the stone fruit season is drawing to a close, many fruit stains will probably be apparent on table linen and children's clothes. Unfortunately the old adage that these stains will disappear when the season for that particular fruit finishes is not founded on fact and more than faith is necessary to remove the unsightly marks.

Like all other stains, fruit stains should, where possible, be treated as soon as they appear, and before the cloths are washed, as the alkali in soap sets the marks into the fabric.

Fresh stains—where the mark is still wet with fruit juice—can be removed by covering them with salt, which absorbs the discolouration. Soaking in salt water may be effective on extensive stains. The article should then be washed without soap.

Where the stains have dried into the fabric, they should be soaked in a borax solution. Use ½ teaspoonful of borax to



PARTY NOVELTIES

Some ideas fur presenting the ever-popular "Peanuts and Lollies" in an attractive form. The squares of cellophane and another pipe-cleaner make the parasol and the posy, and the baloon squares of cellophane and another pipe-cleaner make the parasole and the posy, and the balloon is self-explanatory.

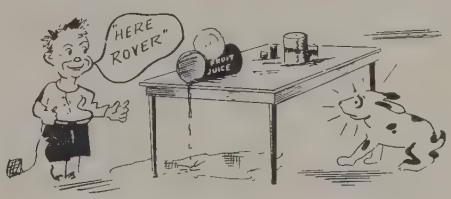
a cup of boiling water for the solution. If the stains occur on delicate or coloured fabrics use warm instead of boiling water.

For stubborn stains on white cotton and linen **only**, a bleaching solution may be needed to remove the stains. As these mixtures destroy colour and weaken more delicate fabrics, they must never be used on coloured cloths, rayons, silks or woollens.

A cheap bleaching solution can be made using four ounces chlorinated lime and two pints of boiling water. Place these in an old bowl and add one tablespoonful of washing soda. Mix with an old wooden spoon until all lumps are dissolved. Cover and allow to stand for at least 12 hours, when all the sediment should have settled. Carefully pour off the clear solution and strain into a bottle, preferably one of dark glass with a glass stopper.

This solution must be further diluted before using it on the stain. Use one part of the bleach to four parts of water. Soak the stain in the diluted solution until it is removed.

Should the stain be still apparent after 20 minutes, it should be removed from the bleaching solution and the article washed. It is better to give two or three short treatments for old stains as long soaking in the bleach will weaken the fibres, and cause them to rot.



After fruit stains have been removed by any of the above methods, the article should be washed thoroughly and boiled, where possible, to complete the removal process.

NOVELTY IDEAS FOR SWEETS

By BRENDA CLEEVE

NOVEL arrangements of sweets for children's parties or bazaars can serve a dual purpose as decorations at little extra work or cost. Here are a few suggestions:—

Peter the Peanut Man.

Take two pipecleaners and twist them together for half their length. Bend the untwisted halves of each cleaner individually to resemble legs, leaving ½in. for feet. Use a third cleaner, attached to the body to form arms.

Choose four even-sized peanuts and place one on the end of each cleaner to form hands and feet. With coloured ink, pencil or paint, mark eyes, mouth and a nose on a larger peanut. Place this on the top of the body section.

Tie a handful of peanuts into a square of coloured paper and attach to the back to form a swag. Attach a length of string or shirring elastic around the body to use for hanging.

The Spider.

Use four pipecleaners and tie together in the centre. Bend the ends out to resemble legs. Tie some peanuts together in coloured paper to form the body and fasten this on to the centre of the legs. With ink mark the eyes at one end. Attach a piece of string or shirring elastic to the centre.

Posies.

Select some small sweet such as jelly beans, boiled lollies or other small, coloured varieties. Cut out some 3in. squares of clear or coloured cellophane and wrap one sweet in each, leaving as long a tail as possible. Place 10 or 12 sweets together and fasten the tails with an elastic band.

Around the edge tie a band of green paper cut in scallops to resemble leaves or use a paper d'oyley to give a decorative effect.

Larger and more elaborate sprays can be made by wiring the wrapped sweets together in groups as when wiring fresh flowers for sprays. When wire is used to hold the groups in position, heavier sweets can be used.

Umbrellas.

To make the handle, bend over one end of a pipecleaner to form the hook. Take a paper d'oyley and place the straight end of the pipecleaner through the centre. Pinch the paper around the cleaner and catch in position with a few stiches. Fold the d'oyley in halves and catch the top edges to the cleaner. Now fold up the side sections to make four positions and fasten these to the handle. Fill with small sweets or popcorn.

These umbrellas can be made more colourful by cutting rounds of coloured paper or cellophane and using these as lining so that the colours show through the pattern in the d'oyley.

Balloons.

Make a shallow container as though for a basket, but without a handle. Instead, attach two long loops of string (approximately 2ft. long), crossing in the centre and secure the four ends spaced evenly around the edge of the container so that it balances.

Fasten the centre of the loops to the bottom of an inflated balloon, with a strip of cellulose tape. Fill the bases with sweets.

These balloons look most attractive hung from a string across a room, or stall.

SILVER POLISHING CLOTH

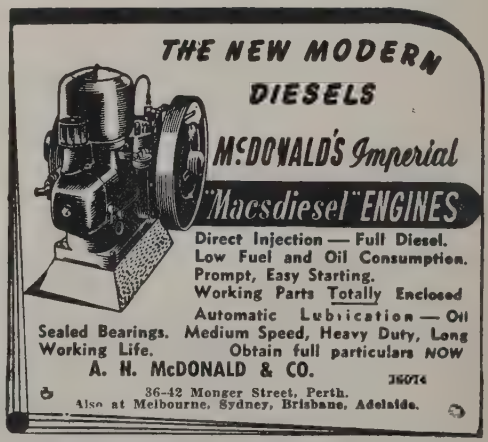
By BRENDA CLEEVE

Table and ornamental silver can be kept gleaming by giving it a regular rub-up. This can be done with a cloth impregnated with silver cleanser. If rubbed-up frequently, difficult-to-remove stains should not appear on the silver, thus eliminating vigorous cleansing which gradually removes the silver plating.

Mix together one tablespoonful of a good silver cleaning powder and one tablespoonful of methylated spirits. To this mixture add one cup of boiling water. In the solution soak a soft, non-fluffy cloth until the fabric is thoroughly saturated.

Squeeze lightly and hang to dry, so that the maximum amount of solution dries through the cloth.

Use this cloth for a quick, clean and easy polishing of your silver. It is not suitable for removing bad stains.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Gerberas

Have Many Fine Qualities

By C. C. HILLARY

ALTHOUGH introduced to Australia more than 50 years ago, it is only in comparatively recent times that the gerbera has won the recognition such a lovely flower deserves. Now this charming South African plant has a wide circle of friends and its popularity is increasing steadily every year.

This is not surprising, since the latter-day gerbera has many fine qualities—qualities that make it one of the most desirable of all the small perennial plants grown in our gardens today. Refined flowers in the loveliest of pastel shades, superb stems, lasting qualities well above the average, and a winsome daintiness that never fails to charm—what more could anyone want?

For forming feature beds, and for growing in border beds either by themselves, or in combination with other flowers, gerberas are ideal. They also make splendid pot plants when grown in 5in. or 6in. pots. The plants flower profusely in spring, summer and autumn and, even in winter, when they are grown in well-drained soil and in a reasonably warm situation, there is a steady production of blooms.

As a cut flower the gerbera has few superiors, the blooms lasting up to 10 days when placed in deep vases containing plenty of water. The colour range is wide and ranges from white and cream through shades of pink, apricot, buff, orange and red to deep crimson.

The original *Gerbera Jamesonii* was a starry, brilliant-red, single flower, but skilful hybridising has produced fine-petalled, single flowers of circular form, as well as many really beautiful doubles. It is not a difficult flower to grow but, like most other plants, it responds well to good cultural treatment. Correct planting is of importance, since it has considerable bearing on the life of the plants, and frequent manuring is necessary as the plants are gross feeders.

CULTURAL TREATMENT

Deeply cultivated soil is necessary to accommodate the extensive root systems, and generous quantities of old animal manure, poultry manure, or a good leafy compost should be worked in when the beds are being prepared. A rich, friable loam is probably the most suitable soil for gerberas, but good results can be obtained in both sandy and heavy soils provided they are properly prepared.

Sandy ground will require additional supplies of humus-forming material and this can be arranged by increasing the animal manure, or by digging in extra supplies of compost or some well-decayed lawn clippings. Heavy soils will need manures, but it is equally important that they should be well-drained. If there is any doubt on this point, the surface of the bed should be raised four or five inches above the level of the surrounding ground, or the bed drained with the aid of agricultural drain pipes placed about two feet below the surface.

PROPAGATION

A bed of gerberas can be established with young plants raised from seeds, or with portions of old clumps that have already flowered. The latter method is the only way of ensuring high-quality flowers of any particular shade.

Seedlings vary considerably. Not every plant produces flowers of good colour and form. More than a few produce coarse-petalled blooms of poor colour and these should be discarded. The best way to handle seedlings is to grow them in small pots

until they flower. Those that measure up to the standard required can then be planted in the garden.

An old clump can be easily divided with a sharp knife and sometimes it is possible to strip suitable pieces from the clumps with the fingers alone. The important thing is that each piece should have a crown, or growth shoot, at the top and a share of the roots below. When planting the portions, the roots should be set straight downwards, not spread outwards, and care must be taken to keep the crown about an inch above the level of the soil.

Depth of planting is most important. More plants are killed by covering the crowns with soil and manure than from any other cause. For this reason, hoeing around the plants must be done carefully. Should manure or soil get into the crown of a plant at any time, it should be washed out with a jet from a hose as soon as noticed.

In spite of care taken during planting, some plants will almost certainly be too low in the ground a year later. The best thing to do with these is to prise them upwards with a strong digging fork during the winter. Although this treatment does break a number of roots, the plants soon recover from the shock and grow all the better the following spring.

Gerbera clumps are usually divided and replanted in early spring, but the seeds may be sown at almost any time during the year. The seed must be fresh, preferably not much more than six or eight weeks old, as it does not retain its germinating powers for long.

RAISING SEEDLINGS

Seed boxes are best for raising the seedlings and these should be filled with a sandy soil compost, which has been enriched with a light dusting of superphosphate. A tablespoonful to the soil in a seed box about 15in. x 9in. will be sufficient. Gerbera seeds are long and narrow with a tuft at one end. They should be sown singly, about an inch apart each way, by pressing the sharp end of the seed into the surface and leaving the small tuft at the other end out of the soil. Germination should take place within a fortnight, and six weeks later the seedlings should be large enough for potting or for transfer into the garden.

Gerberas are warmth-loving subjects, so the beds should be situated in sunny parts of the garden where some protection is provided from cold, southerly winds in winter. The plants will have sufficient elbow room if spaced about 15in. apart.

Ample supplies of water must be provided in summer. Any shortage of soil moisture quickly lessens both the quality and quantity of the flowers. Gerberas also appreciate liquid manure. This can be made from almost any kind of animal manure or poultry manure by soaking a small bag of the droppings in a tub of water for a few days. The resultant solution will be at the correct strength to use when its colour resembles weak tea. It may be applied every three or four weeks, but only after the plants have been well watered.

Gerberas are not affected to any extent by disease, but sometimes the foliage assumes a rusty or dirty appearance in late autumn and winter. These leaves should be removed and burnt as soon as noticed. The plants should then be sprayed with copper oxychloride mixed at the rate of an ounce of the chemical to three gallons of water. It is also good policy to spray all gerbera plants at the end of each winter with copper oxychloride to protect them against fungous diseases.

UNSEASONABLE RAINS ENCOURAGE WEED GROWTH

An unprecedented germination of the noxious weed, caltrop, has followed the February rains, particularly in the Eastern Goldfields area. Other centres from which it has been reported include Merredin, Kellerberrin, Tammin, Northam, Beverley and Wyalkatchem. Plants have also appeared in several localities in the metropolitan area.

Caltrop is an exceedingly troublesome weed producing burrs with stout spines which can cause injury to stock. The plant also has toxic properties.

As the plant grows and matures seeds very rapidly, control measures—spraying with 2,4-D dieseline or power kerosene—should be carried out immediately the plants are detected.

The heavy summer rains have also stimulated the growth of Bathurst burr at Kalgoorlie, Coolgardie, Southern Cross and Marvel Loch, but the position is much better than it was under similar circumstances, several years ago. Every effort is being made to prevent burr formation.

Fig. 1.—Lakeland is a tall-growing variety, and there are usually from five to seven flowers to the cluster, with nearly all clusters producing good quality fruit

THE LAKELAND TOMATO

A Variety that has proved successful for Winter Production

By D. A. JOHNSTON, B.Sc. (Agric.), M.D.A. (Hons.), Agricultural Adviser

YEAR-ROUND tomato production in Western Australia is dependent upon adequate water supplies and freedom from frosts. The metropolitan area and the lower South-West are the summer-producing areas, but winter production is practically confined to the Geraldton district. Many market gardeners in the metropolitan area have frost-free positions however, and there is an opening for varieties which are adapted to winter conditions.

In recent years, there has been an increasing demand for good quality tomatoes during the winter season. Production at Geraldton has largely satisfied this demand, but metropolitan growers have also been keen to share in this expanding market. However, local varieties have proved unprofitable when grown during the winter period, and so the demand for a suitable winter variety has steadily increased. This demand may be, to some extent, overcome by the recently-introduced variety, Lakeland.

ORIGIN OF LAKELAND

The Lakeland variety was imported from California, U.S.A., in 1952 for trial purposes, the variety having already shown itself capable of producing good quality fruit under cool conditions with low light intensities (Advance in Agronomy, Vol. II, 1950, New York, U.S.A.) The variety, therefore, appeared to be worthy of trial, and arrangements were made to carry out a detailed experiment in the 1953 winter season.

In order to test the new introduction, it was necesary to compare it with a local variety which had been grown over the winter period with some success. For this purpose, a selection of the Wanneroo Late variety was used. A high position was selected on an orange-yellow tuart sand with an easterly aspect. The site was thus protected from the main force of the rain-bearing winds. The selection of a suitable site is most important when growing winter tomatoes. Not only should it be situated as already stated; but it must also be frost-free.

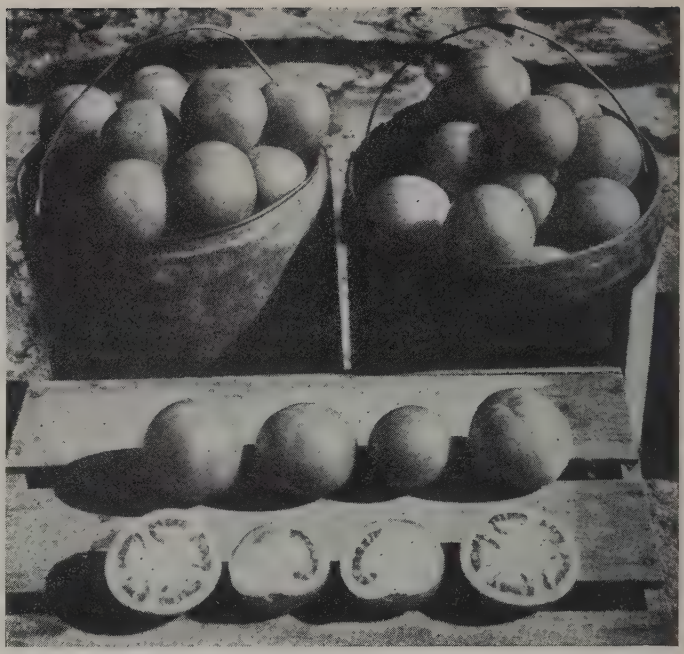

Fig. 2.—Lakeland fruits are smooth, deep and globe-shaped. They are practically free from radial cracking

RESULTS OF TRIALS

Apart from its value for commercial cropping, Lakeland should prove a useful variety for the home gardener who prefers an indeterminate variety. In trials conducted by the Vegetable Branch, Lakeland produced 25 per cent. more fruit by weight than the Wanneroo Late. It was also found that Lakeland produced a far greater quantity of first-grade fruit than Wanneroo Late. In the trials, 83 per cent. of the Lakeland fruit was first grade, as against 58 per cent. of the Wanneroo Late.

The Wanneroo Late variety produced a heavy proportion of second-grade and unsaleable third-grade fruit, as is shown by the following table.

EXPERIMENTAL YIELDS CALCULATED TO TONS PER ACRE.

Variety.	Total Yield.	Yield First Grade Fruit.	Yield Second Grade Fruit.	Yield Third Grade Fruit.
	per acre.	per acre.	per acre.	per acre.
Lakeland	21·88	18·14	1·80	1·94
Wanneroo Late	17·99	10·46	4·03	3·50

Another consideration of importance to the commercial producer and the home gardener, is that the fruit of Lakeland is generally more attractive in appearance than that of the Wanneroo Late.

DESCRIPTION

Lakeland is regarded as a variety suitable for autumn, winter and early spring cropping. It is of earlier maturity than the Wanneroo Late, with larger and more uniform fruit. Unlike the Wanneroo Late variety, Lakeland is almost entirely free from radial cracking. The smooth, deep, globe-shaped fruit carry well and have an excellent flavour.

Like most varieties, Lakeland is susceptible to the early blight fungus (*Alternaria sp.*) and control measures are necessary. The variety is fairly resistant to fusarium wilt, but is susceptible to the eelworm and *Sclerotinia* diseases. Lakeland is tall-growing, of indeterminate growth habit, thus making staking and pruning desirable. There are from five to

seven flowers per cluster, nearly all clusters producing good quality fruit. There is thus no need to discard the plants after the first few clusters have been harvested.

COMMERCIAL PERFORMANCE

Since its introduction in 1953, Lakeland has been grown in one detailed variety trial and in numerous observational trials throughout the metropolitan area. Detailed trials are to be conducted at Geraldton to determine its suitability for this district, and tests are also being carried out at Harvey, on areas where fruit cracking is prevalent, probably due to moisture fluctuations. During the 1954 winter months, a successful commercial crop of approximately two acres was grown by Mr. J. Leach who had made his property available for the initial trials. From 8,000 plants, this crop produced 3,422 half bushel cases of first-quality fruit or approximately 10½ pounds per plant. The total estimate of yield was between 5,500-6,000 cases, the disease *Sclerotinia* accounting for approximately 2,000-2,500 cases. It will be seen that this winter crop of Lakeland tomatoes was quite profitable, yielding more than the average summer crop of Wanneroo Late.

CONCLUSION

From results to date, Lakeland has numerous advantages as a winter tomato. Its high yield of good quality fruit, outweighs the defect that the fruit may be slightly large for commercial purposes. Where suitable sites are available, Lakeland may become a valuable crop for the winter months, as well as being useful to the home gardener who wishes to produce good quality tomatoes during June, July and August.

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VACCINES AND VACCINATION

By C. R. TOOP, B.V.Sc.
Chief Veterinary Surgeon

Fig. 1.—Using an automatic vaccinator to inoculate a sheep with entero-toxaemia vaccine

MANY of the infectious diseases occurring amongst livestock may be prevented by vaccination. The vaccines used for this purpose are usually prepared from cultures of the organisms causing the disease which are killed, and detoxified and so rendered harmless, by the addition of formalin.

When injected, these vaccines stimulate the formation of protective substances known as antibodies in the blood and tissues of the inoculated animal, conferring upon it an immunity which enables it to resist the disease when subsequently exposed. An immunity produced in the animal body in this way is referred to as an active immunity. An interval of about 14 days elapses before it becomes effective, but it endures from several months to a year or longer.

This immunity wanes with the passage of time, and in order that it may at all times be maintained at an effective level, annual inoculation is recommended.

The ability of vaccines to stimulate the formation of antibodies is variable. With products like botulinus toxoid and tetanus toxoid, it is of a high order, whereas with entero-toxaemia vaccine, two injections separated by an interval of three to four weeks may, in some circumstances, be necessary in order to obtain adequate protection.

Among the vaccines in common use in Western Australia the following may be mentioned:—

- Botulinus toxoid—for the prevention of botulism (toxic paralysis) in sheep and cattle.
- Entero-toxaemia vaccine—for the prevention of infectious entero-toxaemia ("pulpy kidney") in sheep.
- Tetanus toxoid—for the prevention of tetanus (lockjaw) in horses, cattle and sheep.
- Blackleg vaccine—for the prevention of blackleg in cattle and sheep.
- Black Disease vaccine—for the prevention of "swelled head" in rams.

Live vaccines, composed either of living viruses or bacterial cultures, may also be used as immunising agents. "Scabby mouth" vac-

cine, used for the prevention of contagious pustular dermatitis ("scabby mouth") in sheep, is an example of a virus vaccine. It is applied to the scarified skin of the thigh, and provided a satisfactory "take" is obtained, produces a lifelong immunity.

Strain 19 Vaccine consists of a live culture of a lowly virulent strain of the microbe *Brucella abortus*, and is highly effective for the control of of brucellosis (contagious abortion) in cattle.

SERUMS

Serum is prepared from the blood of horses which have been injected with large and repeated doses of vaccines. Following this treatment blood is drawn from the jugular vein, and upon setting, the clear fluid or serum which separates is collected, preserved, and transfered to suitable containers.

This serum contains a high concentration of antibodies, and when injected it confers an immediate immunity against the infection for protection against which it has been prepared.

This immunity is referred to as a passive, or borrowed, immunity, and it disappears as soon as the antibodies contained in the serum are eliminated from the body. In contrast with the enduring active immunity stimulated by the injection of vaccines, it is of very short duration and lasts only from two to three weeks. It is, nevertheless, of very great value for the prevention of mortality when an outbreak of disease is imminent or in progress, and the time interval is too short to allow of the establishment of an active immunity by vaccination.

Examples of serums in common use are pulpy kidney anti-toxin and tetanus anti-toxin. The latter product may be relied upon to prevent losses from tetanus if injected when a wound is inflicted.

METHOD OF INOCULATION

The greatest care must at all times be exercised to ensure that vaccines do not become contaminated during use, since failure to observe this precaution may result in mortality from tetanus or some other infection. A number of serious mortalities from tetanus following careless inoculation have been reported during recent years.

Syringes and needles must always be sterilised by boiling before use, and vaccine containers must be covered so as to exclude dust. Vaccine which has been opened but unused at the completion of the day's operations should be discarded.

INOCULATION OF SHEEP

For preference, sheep should be inoculated in the shearing shed, since this will reduce the risk of contamination by dust to a minimum. In

Fig 2.—A vaccination team at work. One man holds the sheep, another swabs the site of the injection with methylated spirits, while the third operates the automatic vaccinator

addition, the small holding pens will facilitate catching, and the sheep may be released through the counting out pens as the operation is completed.

When it it is necessary to work in the open it will be found convenient to inoculate in a small yard holding about 50 sheep. This can be filled as required from larger yards adjoining it, and confusion will be avoided by inoculating in close proximity to the gate and releasing the sheep into the receiving yard when the injection has been given.

EQUIPMENT

The following equipment will be required:—

A 20 c.c. "Record" hypodermic syringe or an automatic vaccinator.

Six No. 18 or No. 19 Veterinary hypodermic needles.

A quantity of cotton wool and methylated spirits.

STERILISATION

Syringes must be sterilised before use. To avoid cracking during heating, the metal plunger must be withdrawn from the glass barrel. Together with the spare needles, the syringe is placed in a vessel of cold water, brought to the boil, and kept boiling for five minutes. Upon cooling, the syringe is assembled, care being taken to handle only the outside of the barrel, the plunger by the stem, and the needle by its butt. This will prevent contamination by the fingers of those parts of the syringe which will come into contact with the vaccine. Such contamination would undo the work of sterilisation. Spare needles should be transferred to a jar of methylated spirits for use as sterilised replacements should the needle in use become damaged or soiled.

A small jar fitted with a lid, which has also been sterilised by boiling, will serve as a container to which vaccine may be added from the bottle as required. This container should be kept covered so as to exclude dust, and the lid should only be removed during replenishment and while the syringe is being recharged.

Some vaccines contain a heavy deposit in which the active ingredient is concentrated, and must be shaken vigorously before the contents of the bottle are removed.

Vaccine and equipment should be placed on a small table or packing case outside the catching pen where they will not be damaged by the sheep, but are within easy and convenient reach of the operator.

For convenience, the sheep should be held in the same position as for crutching, and the injection should be made in an area bare of wool, such as the inside of the thigh or the side of the brisket beneath the forearm. Some operators prefer to inoculate in the standing position using a race, and making the injection behind the shoulder. In shorn sheep this is a simple procedure, but with sheep in the wool the fleece must be parted so as to expose the underlying skin.

The syringe should be filled to the 20 c.c. mark and, depending on the dosage, will then contain sufficient vaccine for the inoculation of several sheep, i.e., with a 5 c.c. dose rate, it will contain enough vaccine for four sheep. Air bubbles should be expelled by gentle pressure on the plunger with the syringe held vertically. The skin at the site of injection should be cleansed by swabbing with cotton wool steeped in methylated spirits.

To make the injection a fold of skin should be taken up betwen the thumb and forefinger, and penetrated by a thrust of the needle, which should lie just beneath the skin, where it can be felt. Deep penetration should be avoided.

The required dose of vaccine is injected by pressure on the plunger.

THE AUTOMATIC VACCINATOR

This instrument consists of a small hypodermic syringe or "gun", connected by rubber tubing to a stopper perforated by two metal tubes, which plugs into the vaccine bottle. The rubber tubing attaches to the shorter of these tubes; the longer one serving as an air inlet. The syringe may be adjusted by means of a set screw to deliver the required dose of vaccine, and after the injection is made, it refills automatically. Harness, which enables the outfit to be strapped to the body of the operator, is provided.

Syringes of this type may be sterilised without dismantling. The pumping of boiling water through the tubing and handpiece is the method of sterilisation advised by the manufacturer, but the immersion of these parts in water kept at boiling point for five minutes would obviously be safer.

The automatic vaccinator greatly increases the rate at which inoculation can be carried out, and it is of particular value in large flocks. Since it is connected direct to the bottle in which the vaccine is supplied, it eliminates the risk of contamination by dust, and is safer in the hands of the farmer than the hypodermic syringe.

EFFECTS OF VACCINATION

Apart from slight to moderate lameness, which may persist for a few days in some animals following treatment, inoculated sheep suffer no ill effects. With some vaccines a firm nodule develops at the site of the inoculation, and a period of months may elapse before it is completely absorbed.

INOCULATION OF CATTLE

In the inoculation of cattle, the same method as described for sheep should be employed, and during treatment they should be restrained in a crush or bail. The injection may be made at any point beneath the skin, but it is advisable to choose a site where the skin is thin and loosely attached, such as in front of the shoulder or over the ribs just behind the elbow. The skin of the bovine is thicker and more difficult to penetrate than that of the sheep, and a No. 16 needle, which is stronger than the No. 18 needle advised for sheep, is recommended.

Horses should be inoculated beneath the skin of the neck and, to avoid injury, the operator should stand close to the shoulder of the animal when making the injection. With nervous animals a crush should be used or a twitch applied to the nose.

CARE OF SYRINGES AND NEEDLES

After use, the syringe and needles should be flushed out with cold water and then with methylated spirits, following which the needles may be left in a warm oven overnight to ensure that they dry out completely. Cleaning in this way will prevent the plunger becoming jammed in the barrel and the needles from becoming blocked, in which case neither would be of any further use, and would have to be discarded. As a further precaution, it is advisable before storing the syringe to remove the plunger from the barrel. With the automatic vaccinator, flushing with cold water and then with boiling water after use is sufficient.

Sterilisation by boiling will, of course, be necessary before this equipment is again used for inoculation purposes.

ARGENTINE ANTS

The Argentine Ant Control Committee advises that spraying operations were proceeding satisfactorily in local authority areas receiving attention south of the Swan River. Approximately 4,000 acres have been treated since the scheme began, and many householders have expressed their appreciation of the relief which has followed the treatment of their premises.

Inspections have recently been carried out by entomologists at country centres. Small outbreaks have been dealt with at Manjimup and Yarloop, and investigations at Harvey, Wagerup, Waroona, Katanning and Cranbrook show that work carried out in these areas in previous seasons has been successful, as no surviving ants could be detected.

In order to assist residents in districts north of the Swan River where the major scheme would not operate this season, arrangements have been made for free insecticide to be made available to residents prepared to carry out spraying on a co-operative basis. Where about a dozen neighbours could arrange to treat their premises jointly, an application should be made to the local authority for spray material. Where possible, areas to be sprayed should be bounded by streets or right-of-ways so that when the entire block has been completed the risk of re-infestation would be reduced to a minimum. It was reported that unnecessary delay in approving applications for spray material has occurred due to householders forwarding their applications direct to the Department of Agriculture. In all cases the initial approach should be made to the local authority.

CODLING MOTH

Outbreaks Eradicated Promptly

No signs of Codling Moth have been seen at Mullalyup and Nannup for three seasons and it is now considered that the outbreaks have been eradicated.

The two outbreaks were reported separately in the summer of 1951 and swift action was taken by the Department to define and quarantine the affected areas. Measures to eradicate the pest were put into operation immediately.

The outbreaks were the largest ever to occur in this State and as they were in commercial fruit growing districts close to main producing areas the difficulties of eradication were increased. Approximately 140 acres of orchards in the Mullalyup district and 70 acres in the Nannup district were affected.

The Government, at the time and since, provided adequate financial assistance for the purchase of modern power spraying machines, tractors and materials and staff to cope with the outbreaks. In addition, funds were provided in the initial stages to compensate growers who could not market their fruit on account of quarantine restrictions and later for compensation for losses incurred by spray burn and spray residues.

The active steps taken to eradicate the pest during 1951 brought encouraging results during the following growing season. Although a small number of Codling Moth lavae were found in restricted areas in both districts, no signs of infestation could be found on many orchards that were previously grossly infested.

The treatments were continued during 1952 and subsequent years, but despite many close surveys, no further traces of the pest could be found.

IMPORTATION OF DEEP FROZEN BOVINE SEMEN

HISTORY was made on January 5, 1955, when a consignment of 100 cc of deep frozen bull semen reached Perth from London. This was the first consignment of deep frozen semen to be imported into Western Australia. It was procured from the Milk Marketing Board in Great Britain by the South-West Co-operative Dairy Farmers Ltd., Bunbury, on behalf of Mr. R. B. Lefroy, of Waterloo, for the insemination of his dairy herd of 50 milking shorthorn cows.

Although artificial insemination has been practised for many years, the deep freeze technique is a new procedure which was developed about two years ago by British veterinarians and it is still in the experimental stage.

After collection, the semen is diluted with the usual egg yolk citrate buffer and cooled to 5°C. An equal amount of the diluent containing 20 per cent. glycerol is then added giving a final concentration of 10 per cent. glycerol which protects the sperm against the otherwise fatal effects of freezing and thawing.

The diluted semen contained in sealed ampoules is then cooled by the addition of solid carbon dioxide or dry ice, at first slowly to -10°C and then rapidly to -79°C at which temperature it is stored. When required for use it is thawed by immersing the ampoule in water at 37 to 40°C.

Observations in Britain have shown that deep frozen semen will retain its fertilising capacity for at least a year. This opens up wide possibilities, since it enables a bull of outstanding merit to be used to the maximum possible extent and even to get calves after its death. It also enables stock breeders in remote countries to obtain the services of an outstanding bull without incurring the heavy cost of purchase and transportation.

It was reported recently that a consignment of deep frozen semen flown from Cambridge to Johannesburg had been used for the insemination of two dairy herds for a period extending over four and a half months with highly satisfactory conception rates.

The semen for Perth was put up in ampoules, each of 1 cc, and packed in a heavily insulated cabinet about half the size of a tea chest with a tray of alcohol in which the ampoules were immersed and a removable compartment or well as a container for the dry ice.

It was consigned by air via Singapore and Darwin and arrangements were made for the replenishment of the dry ice en route.

Upon arrival at Perth the semen was found on microscopic examination to contain only about 1% of motile sperm and although the importer intends to proceed with inseminations it is hardly to be expected that they will prove successful. An unfortunate delay of four days had occurred at Darwin and it is thought that the dry ice may not have been adequately replenished during this period.

Elaborate quarantine precautions were taken against the introduction of disease. The semen was required to be derived from an artificial insemination centre supervised by a veterinary surgeon and licensed by the Ministry of Agriculture and Fisheries. The donor bull was required to be tested for T.B. and brucellosis, to be certified free of vibriosis and trichomoniasis and to have proved of good fertility. In addition the Ministry was required to furnish a certificate that neither the insemination centre nor any of the farms serviced by it had been under foot and mouth disease restriction for six months prior to the collection of the semen or for 30 days thereafter.

Whether or not the venture proves successful, the experience gained should be of considerable value to other importers, and Mr. Lefroy is to be commended for his enterprise.—C.R.T.

(This broadcast script was made available by courtesy of the Australian Broadcasting Commission.)

SUNRISE AND SUNSET TIMES FOR MARCH - APRIL, 1955

(Supplied by the Government Astronomer)

Times of sunrise and sunset for every fifth day, are given for a number of towns throughout the State. Times for a town not on the list may be estimated if its position in relation to one or more of the listed towns is known. The times given for sunrise are those of the first appearance of the top edge of the sun over a true horizon; those for sunset give the time of the sun's disappearance below a true horizon. Situation in a valley would make the sun appear to rise later, and on a hill it would appear earlier.

SUNRISE

Month.	Day of Month	Broome.	Port Hedland.	Onslow.	Carnarvon.	Yalgoo.	Geraldton.	Moora.	Kalgoorlie.	Southern Cross.	Merredin.	Perth.	Tammin.	Northam.	Narrogin.	Collie.	Bunbury.	Katanning.	Bridgetown.	Hopetoun.	Esperance.	Cape Leeuwin.	Albany.
May	1	6·4	6·21	6·38	6·46	6·38	6·49	6·45	6·23	6·32	6·36	6·48	6·41	6·44	6·43	6·48	6·50	6·44	6·49	6·34	6·27	6·54	6·43
,, ...	5	6·6	6·23	6·40	6·49	6·41	6·52	6·49	6·27	6·36	6·40	6·51	6·44	6·47	6·47	6·52	6·54	6·47	6·52	6·37	6·30	6·57	6·47
,, ...	10	6·6	6·24	6·41	6·51	6·44	6·54	6·52	6·30	6·39	6·43	6·55	6·48	6·51	6·50	6·55	6·57	6·51	6·56	6·41	6·34	7·1	6·51
,, ...	15	6·9	6·27	6·44	6·54	6·47	6·57	6·55	6·33	6·42	6·46	6·58	6·51	6·54	6·53	6·58	7·0	6·54	6·59	6·44	6·37	7·4	6·54
,, ...	20	6·11	6·29	6·46	6·56	6·50	7·0	6·58	6·36	6·45	6·49	7·1	6·54	6·57	6·57	7·2	7·4	6·58	7·3	6·48	6·41	7·8	6·58
,, ...	25	6·13	6·31	6·49	7·0	6·53	7·4	7·2	6·40	6·49	6·53	7·4	6·57	7·0	7·1	7·6	7·8	7·2	7·7	6·52	6·45	7·12	7·2
,, ...	31	6·15	6·33	6·51	7·2	6·55	7·6	7·4	6·42	6·51	6·55	7·8	7·1	7·4	7·4	7·9	7·11	7·6	7·11	6·56	6·49	7·16	7·6
June	1	6·15	6·34	6·52	7·2	6·56	7·7	7·5	6·43	6·52	6·56	7·9	7·2	7·5	7·5	7·10	7·12	7·7	7·12	6·57	6·50	7·17	7·7
,, ...	5	6·16	6·34	6·52	7·3	6·58	7·9	7·7	6·45	6·54	6·58	7·10	7·3	7·6	7·7	7·12	7·14	7·8	7·13	6·58	6·51	7·18	7·8
,, ...	10	6·18	6·36	6·54	7·5	7·0	7·11	7·9	6·47	6·56	7·0	7·13	7·6	7·9	7·9	7·14	7·16	7·11	7·16	7·1	6·54	7·21	7·11
,, ...	15	6·19	6·38	6·56	7·7	7·2	7·13	7·12	6·50	6·59	7·3	7·15	7·8	7·11	7·12	7·17	7·19	7·13	7·18	7·3	6·56	7·23	7·14
,, ...	20	6·20	6·39	6·57	7·8	7·3	7·14	7·13	6·51	7·0	7·4	7·6	7·9	7·12	7·13	7·18	7·20	7·14	7·19	7·4	6·57	7·24	7·15
,, ...	25	6·21	6·40	6·58	7·9	7·4	7·15	7·14	6·52	7·1	7·5	7·18	7·11	7·14	7·14	7·19	7·21	7·15	7·20	7·5	6·58	7·25	7·16
,, ...	30	6·22	6·41	6·59	7·10	7·5	7·16	7·15	6·53	7·2	7·6	7·18	7·11	7·14	7·15	7·20	7·22	7·16	7·21	7·6	6·59	7·26	7·17

SUNSET

Month.	Day of Month	Broome.	Port Hedland.	Onslow.	Carnarvon.	Yalgoo.	Geraldton.	Moora.	Kalgoorlie.	Southern Cross.	Merredin.	Perth.	Tammin.	Northam.	Narrogin.	Collie.	Bunbury.	Katanning.	Bridgetown.	Hopetoun.	Esperance.	Cape Leeuwin.	Albany.
May	1	5·31	5·44	5·55	5·57	5·41	5·48	5·40	5·18	5·27	5·31	5·39	5·32	5·35	5·32	5·37	5·39	5·29	5·34	5·19	5·12	5·39	5·26
,, ...	5	5·30	5·42	5·53	5·54	5·38	5·45	5·36	5·14	5·23	5·27	5·36	5·29	5·32	5·28	5·33	5·35	5·26	5·31	5·16	5·9	5·36	5·22
,, ...	10	5·27	5·39	5·50	5·50	5·34	5·42	5·32	5·10	5·19	5·23	5·31	5·24	5·27	5·24	5·29	5·31	5·21	5·26	5·11	5·4	5·31	5·17
,, ...	15	5·25	5·37	5·48	5·48	5·31	5·39	5·29	5·7	5·16	5·20	5·28	5·21	5·24	5·20	5·25	5·27	5·17	5·22	5·7	5·0	5·27	5·13
,, ...	20	5·25	5·37	5·47	5·47	5·30	5·37	5·27	5·5	5·14	5·18	5·26	5·19	5·22	5·18	5·23	5·25	5·15	5·20	5·5	4·58	5·25	5·11
,, ...	25	5·23	5·35	5·44	5·45	5·28	5·35	5·25	5·3	5·12	5·16	5·24	5·17	5·20	5·15	5·20	5·22	5·12	5·17	5·2	4·55	5·22	5·8
,, ...	31	5·22	5·34	5·44	5·43	5·25	5·32	5·22	5·0	5·9	5·13	5·20	5·13	5·16	5·12	5·17	5·19	5·8	5·13	4·58	4·51	5·18	5·4
June	1	5·22	5·34	5·44	5·43	5·25	5·32	5·22	5·0	5·9	5·13	5·20	5·13	5·16	5·12	5·17	5·19	5·8	5·13	4·58	4·51	5·18	5·4
,, ...	5	5·21	5·33	5·43	5·42	5·24	5·31	4·59	5·8	5·12	5·19	5·12	5·15	5·11	5·16	5·16	5·18	5·7	5·12	4·57	4·50	5·17	5·3
,, ...	10	5·22	5·34	5·44	5·42	5·24	5·31	5·21	4·59	5·8	5·12	5·19	5·12	5·15	5·11	5·16	5·18	5·7	5·12	4·57	4·50	5·17	5·3
,, ...	15	5·23	5·34	5·44	5·42	5·24	5·31	5·21	4·59	5·8	5·12	5·19	5·12	5·15	5·11	5·16	5·18	5·7	5·12	4·57	4·50	5·17	5·3
,, ...	20	5·24	5·35	5·45	5·43	5·24	5·31	5·21	4·59	5·8	5·12	5·19	5·12	5·15	5·11	5·16	5·18	5·7	5·12	4·57	4·50	5·17	5·3
,, ...	25	5·25	5·36	5·46	5·44	5·25	5·32	5·22	5·0	5·9	5·13	5·21	5·14	5·17	5·12	5·17	5·19	5·8	5·13	4·58	4·51	5·18	5·4
,, ...	30	5·26	5·37	5·47	5·45	5·27	5·34	5·24	5·2	5·11	5·15	5·22	5·15	5·18	5·14	5·19	5·21	5·10	5·15	5·0	4·53	5·20	5·6